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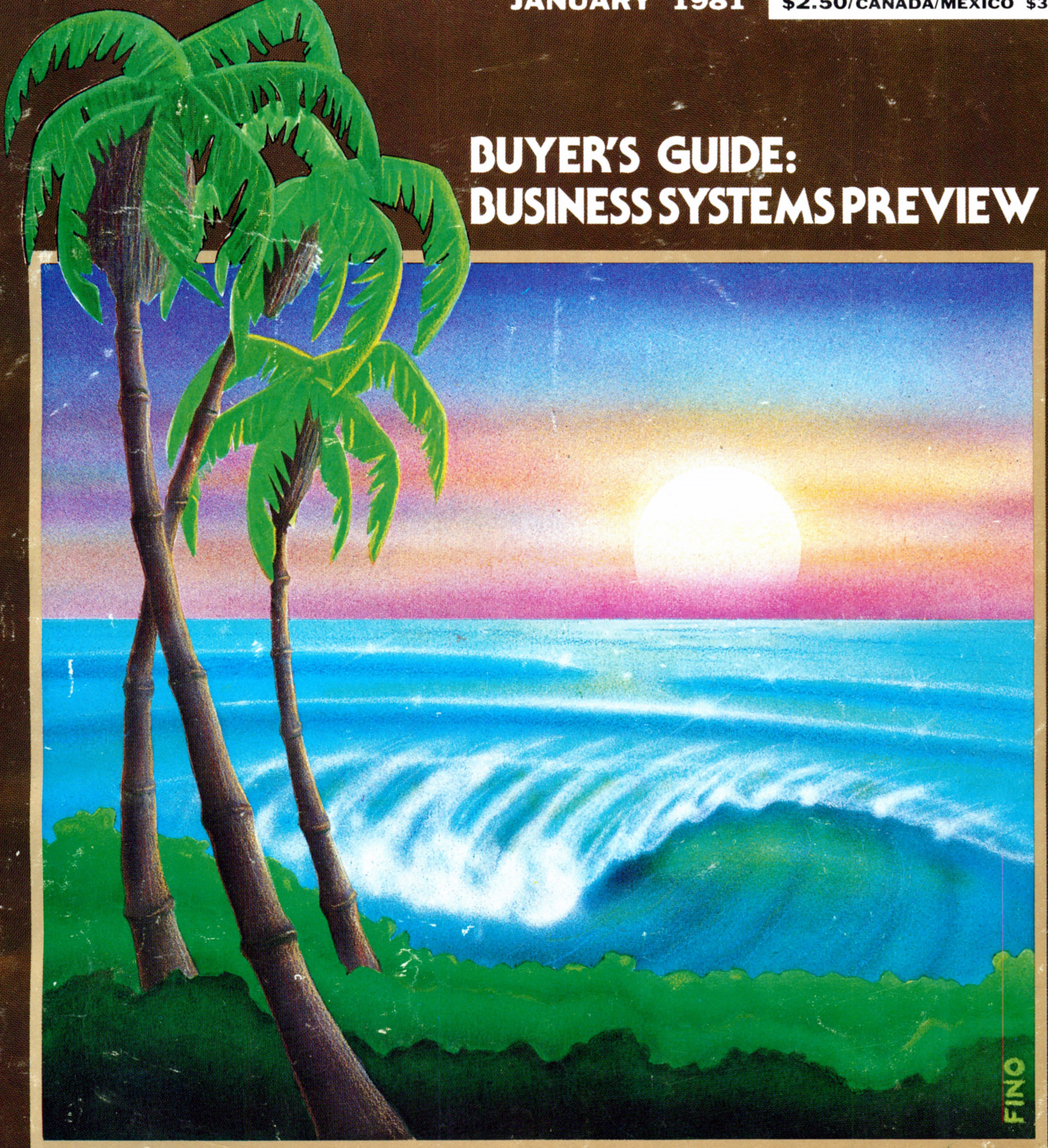

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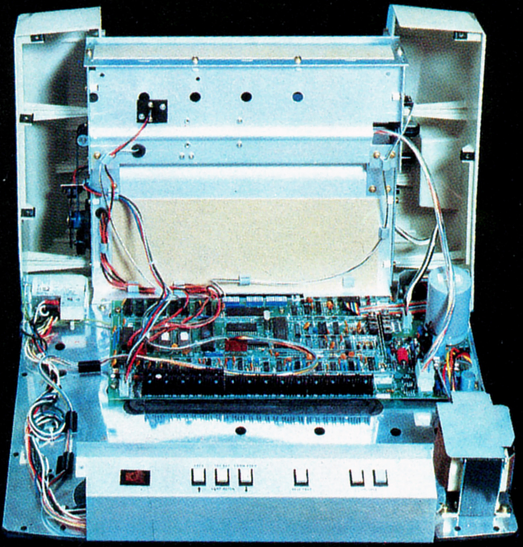

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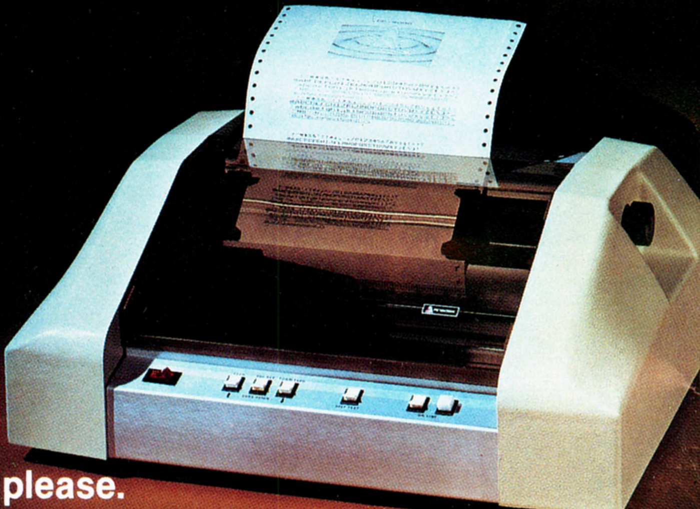

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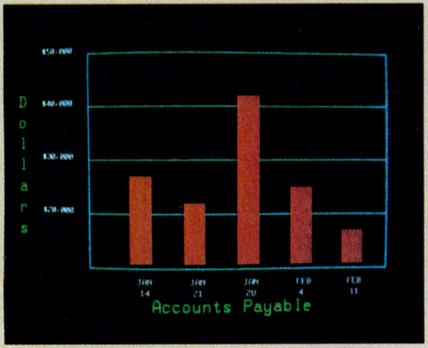
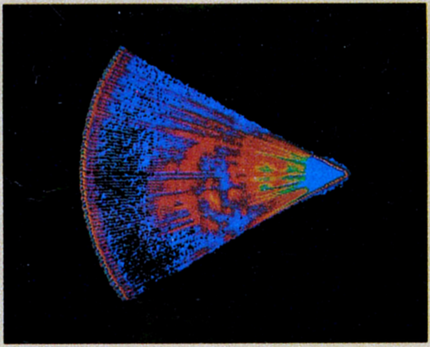


Management Information Display



Ultrasonic heart sector scan

HIGH POINT RESOLUTION
482 (vertical) x 756 (horizontal)

High-resolution display with alphanumerics

Get the professional color display that has BASIC/FORTRAN simplicity

LOW-PRICED, TOO

Here's a color display that has everything: professional-level resolution, enormous color range, easy software, NTSC conformance, and low price.

Basically, this new Cromemco Model SDI* is a two-board interface that plugs into any Cromemco computer.

The SDI then maps computer display memory content onto a convenient color monitor to give high-quality, high-resolution displays (756 H x 482 V pixels).

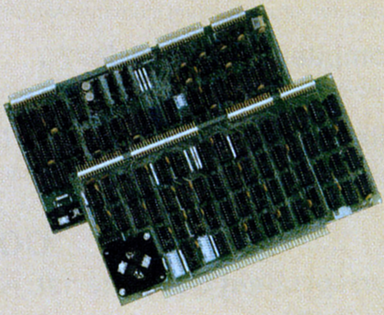
When we say the SDI results in a high-quality professional display, we mean **you can't get higher resolution than this system offers in an** NTSC-conforming display.

The resolution surpasses that of a color TV picture.

BASIC/FORTRAN programming

Besides its high resolution and low price, the new SDI lets you control with optional Cromemco software packages that use simple BASIC- and FORTRAN-like commands.

Pick any of 16 colors (from a 4096-color palette) with instructions like DEFCLR (c, R, G, B). Or obtain a circle of specified size, location, and color with XCIRC (x, y, r, c).



Model SDI High-Resolution Color Graphics Interface

HIGH RESOLUTION

The SDI's high resolution gives a professional-quality display that strictly meets NTSC requirements. You get 756 pixels on every visible line of the NTSC standard display of 482 image lines. Vertical line spacing is 1 pixel.

To achieve the high-quality display, a separate output signal is produced for each of the three component colors (red, green, blue). This yields a sharper image than is possible using an NTSC-composite video signal and color TV set. Full image quality is readily realized with our high-quality RGB Monitor or any conventional red/green/blue monitor common in TV work.

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CONTACT YOUR REP NOW

The Model SDI has been used in scientific work, engineering, business, TV, color graphics, and other areas. It's a good example of how Cromemco keeps computers in the field up to date, since it turns any Cromemco computer into an up-to-date color display computer.

The SDI has still more features that you should be informed about. So contact your Cromemco representative now and see all that the SDI will do for you.

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SINCE DECEMBER 1975

JANUARY 1981

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COMPUTING FOR BUSINESS AND HOME APPLICATIONS

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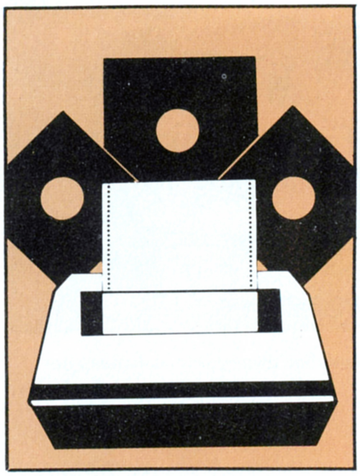

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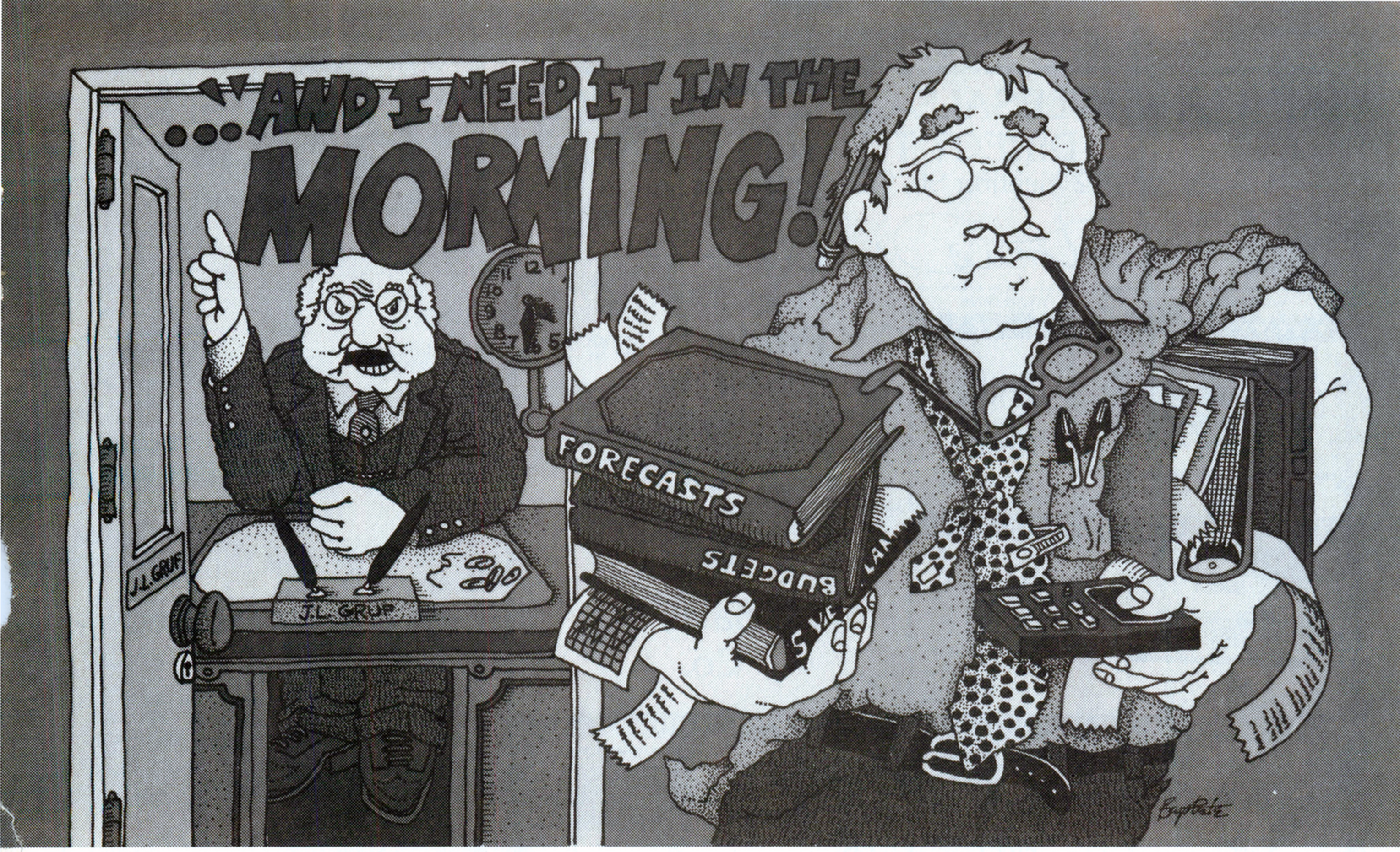

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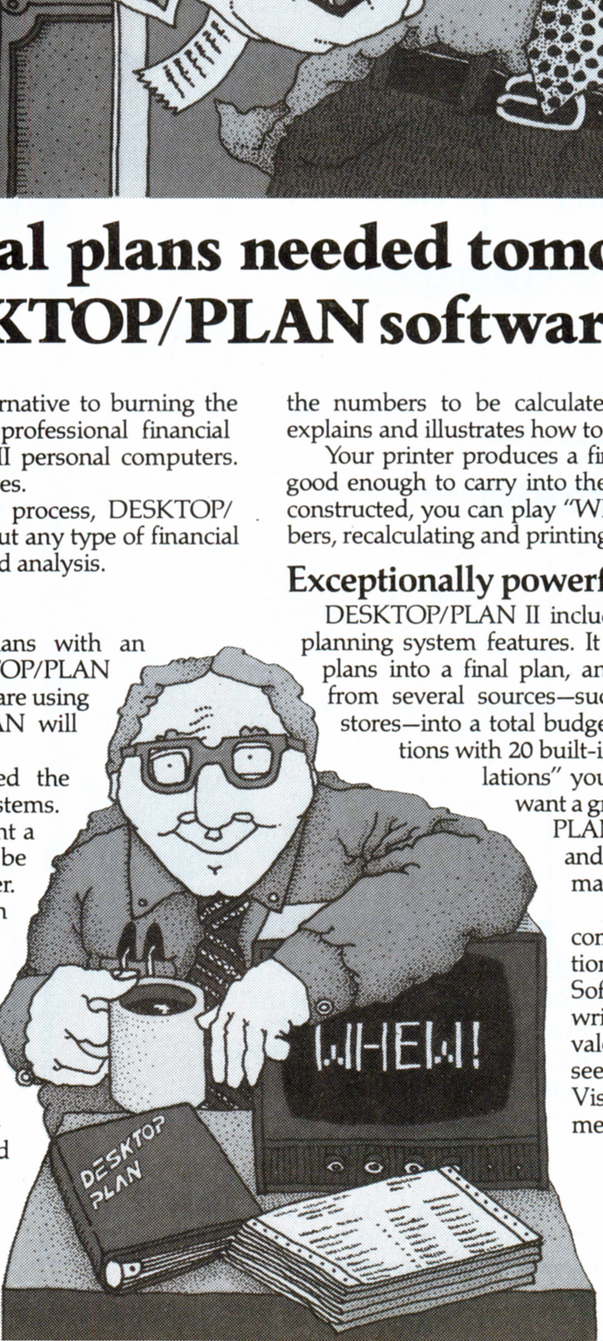

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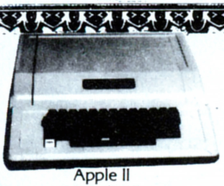
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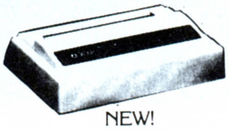
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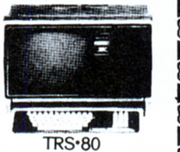
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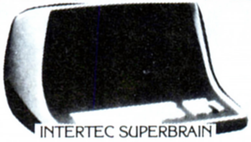
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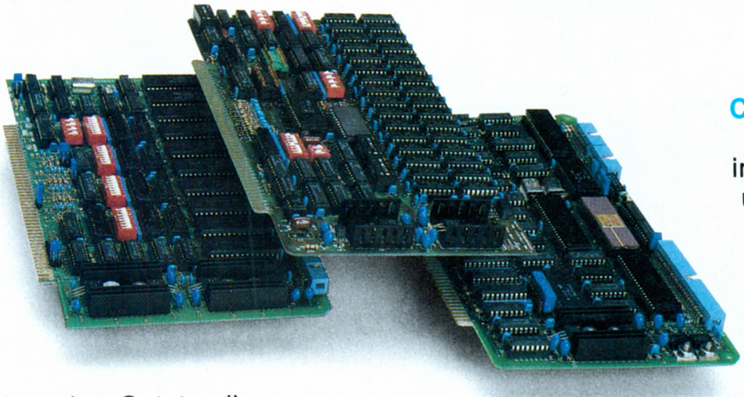

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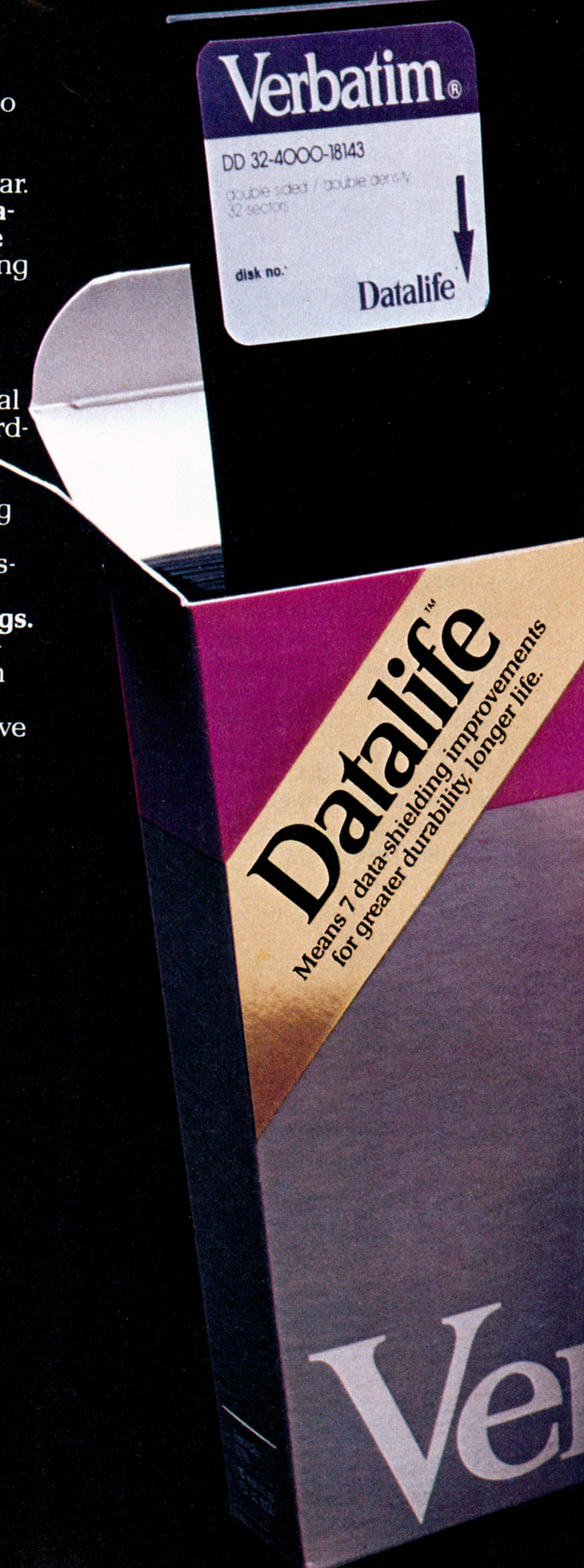
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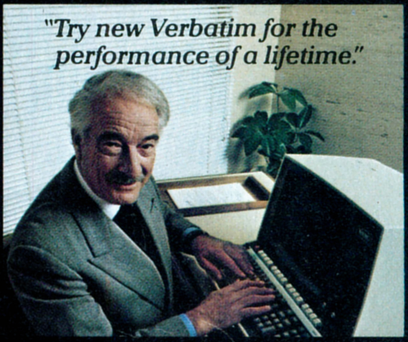

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EDITOR'S NOTEBOOK

Mini/micro confab draws poorly

Sponsored by the hopeful and attended by the faithful...but it wasn't enough. The Mini/Micro Computer Conference and Exposition, this year set in the dungeon suite of San Francisco's Brooks Hall, sought a middle ground between mini and microcomputers.

That this second annual show did not compare in size or quality with the National Computer Conference is no surprise. NCC has several years' head start, and is *the* showplace for the industry.

The show housed some 24 technical programs, but fewer than a hundred vendors exhibited. The clear losers among them were the OEM products—parts and subassemblies that, when integrated with other parts, become complete computer systems. OEM booths displayed lonely salespersons desperately awaiting the noncoming traffic.

The winners, surprisingly, were the local computer stores showing complete micro systems with integrated software packages. These booths were (relatively) well visited by potential buyers wanting to see what a computer could do for them. They were little swayed by cutaway models of the newest in disk drive technology, but genuinely impressed by a well thought-out word processing package that could save time and mistakes in the office.

We're discouraged by this, but still believe in the show's premise: the arena of big micros and little minis (scarcely a difference now) is going to be the action scene in the coming 2-4 years. The march toward technology isn't slowing down, generating more capable, more reliable and less costly machinery.

On the software side, it's a different story. The alleged advances are really old ideas in new clothing. The computer industry has solved many of the problems to make the "big" micros work. The most common adaptation is multiuser operation: that is enabling more than one person to use a computer at the same time. In order to make this capability useful, the designer must tackle a host of problems that go far deeper than merely figuring out how to connect two terminals to the same processor. Problems like allowing various users to access data without getting in each other's way...or providing security methods to keep operators out of sensitive areas (like payroll files) while still allowing free access to change the data...or developing a trouble-free way to let system users share expensive resources: printers and disk drives.

These problems, and many like them, were solved a decade or more ago. But until recently, a sort of isolationism delayed these well worked-out solutions from being adapted in micros. Microcomputer factories are largely the realized dreams of a class of antiestablishment entrepreneurs bent on solving their own problems. They would not consider approaching "the establishment" for solutions.

Conversely, we saw the designers of today's ultra-capable computers withholding solutions the micro world needs so badly.

There is emerging, however, a pioneer group of "crossover" artisans: maxi and minicomputer designers who are finding homes in the micro factories. This is a quiet but significant phenomenom; one that will ultimately have strong impact on the kinds of micros you will be able to purchase during the next several years. There is little more concrete evidence that the "hobby" computers have grown up. Some very heavy talent is sifting down—we prefer to say "forward"—into the microcomputer world. The new technology micro hardware has found a necessary companion: software architect covering the same tricky ground the second time around. The sum of these is greater than the two parts alone.

A visit to Dynabyte in Menlo Park, CA, brings this movement into focus. This small company began its life building S-100 memory boards for the hobby market back when microcomputer owners were invariably microcomputer *builders*. Dynabyte currently offers a good range of small business computers, and is in the midst of a vigorous developmental effort to move into the "big" micro field. How are they accomplishing this? With talent. The new kind of crossover talent. A walk through the engineering department reveals a rich sprinkling of Ph.Ds on the name tags. Two of the staff have years of experience at Bell Laboratories, mother of the amazing Unix operating system. This group is deeply immersed in planning sessions for multi-micro networking and other advanced ways to extract big computer performance from low-cost micros.

Micro manufacturers like Dynabyte are learning that a near-term formula for success is to apply yesterday's proven software solutions to today's design challenges. The result is an accelerated development cycle, and the assurance that the resultant systems will probably be quite mature when they reach your retailer's showroom. Smarter, more experienced designers mean better, more useful computers for our businesses. They're the player, but ultimately we're the winners.

TF

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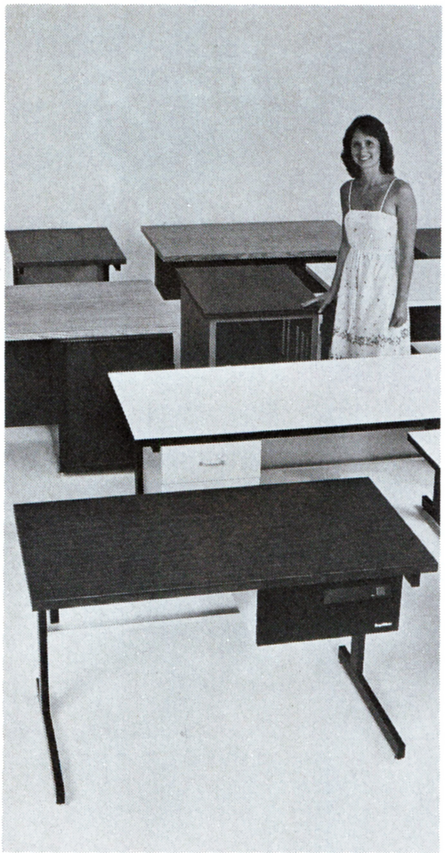

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CIRCLE INQUIRY NO. 10

LETTERS

CAT backtrack

The article on the Cado CAT (IA Sep 80) stated that the author of the CAT system was Phoenix Performance Systems of St. Paul. Cado Systems Corp. of Torrance contracted with Open Systems, Inc. to produce the CAT system. Open Systems previously authored all of the financial accounting application packages in current use by over 4000 businesses, and contracted with Phoenix to participate in the development of the curriculum text for the teaching diskettes. However, the design of the CAT tutorial system and development of the teaching software was done by Open Systems.

Ann L. Winblad
Open Systems, Inc.
Minneapolis, MN

Out of this world

Wow! Atari Orbits (Game Corner Aug 80) was great! I modified the program for "bounce-back." If the object is off-screen, it is replaced on the boundary with the velocity reversed in direction and at 1/10 its former speed. This way, gravitational slingshot will not speed it up to infinity.

I also added sound. Just add these lines:

```
112 Sound 1, X(I) ,10,10
115 Sound 2, Y(I) ,10,10
```

If you have three or more objects, the primary sound is the last object, because the sound hangs with the next iteration. The others cause quick chirps.

David G. Bartholomew
Van Nuys, CA

Stock in trade

Are any stockbrokers doing client record keeping and posting with their microcomputer; and if so, what software package are they using? A software package to accomplish posting must be able to input the numerical fields on a brokerage firm confirmation, perform various calculations on these fields, sort on a variety of these fields to produce a cross referencing by individual stock or bond, and then store and output the result. While I feel Visicalc is good, my hopes are that there is a software package already designed with the stockbroker in mind.

I'm using a 48K Apple II Plus with one disk and a Centronics microprinter. Any help would be greatly appreciated.

Paul J. Robinson
P.O. Box 1969
Eugene, OR 97440

Reliable source

Re the article HDOS or CP/M (IA Sep 80), Charles K. Ballinger states that he is unhappy about the lack of source code for HDOS. In the latest catalog for Heathkit, that source listing is available. See retail catalog 850R, fall 1980, page 47.

Jennifer McGraw
Miami, FL

Maxi question

I have some difficulty determining the difference between a microcomputer and a minicomputer. Can you enlighten a complete stranger to computers?

Clarence Roberts
Rio Rancho, NM

This is one of the most commonly asked—and difficult to answer—questions in the industry. Minicomputers were introduced in the 1960s as low-cost replacements for the then-available large systems (now called mainframes). Microcomputers are usually those that depend upon single-chip microprocessors (8080, 6800, Z8000, etc.) Minis may have a hundred or more individual components performing the same tasks at (usually) higher speed. Recent developments with micros make some of them very competitive with minis in performance and price.

Who's to complain?

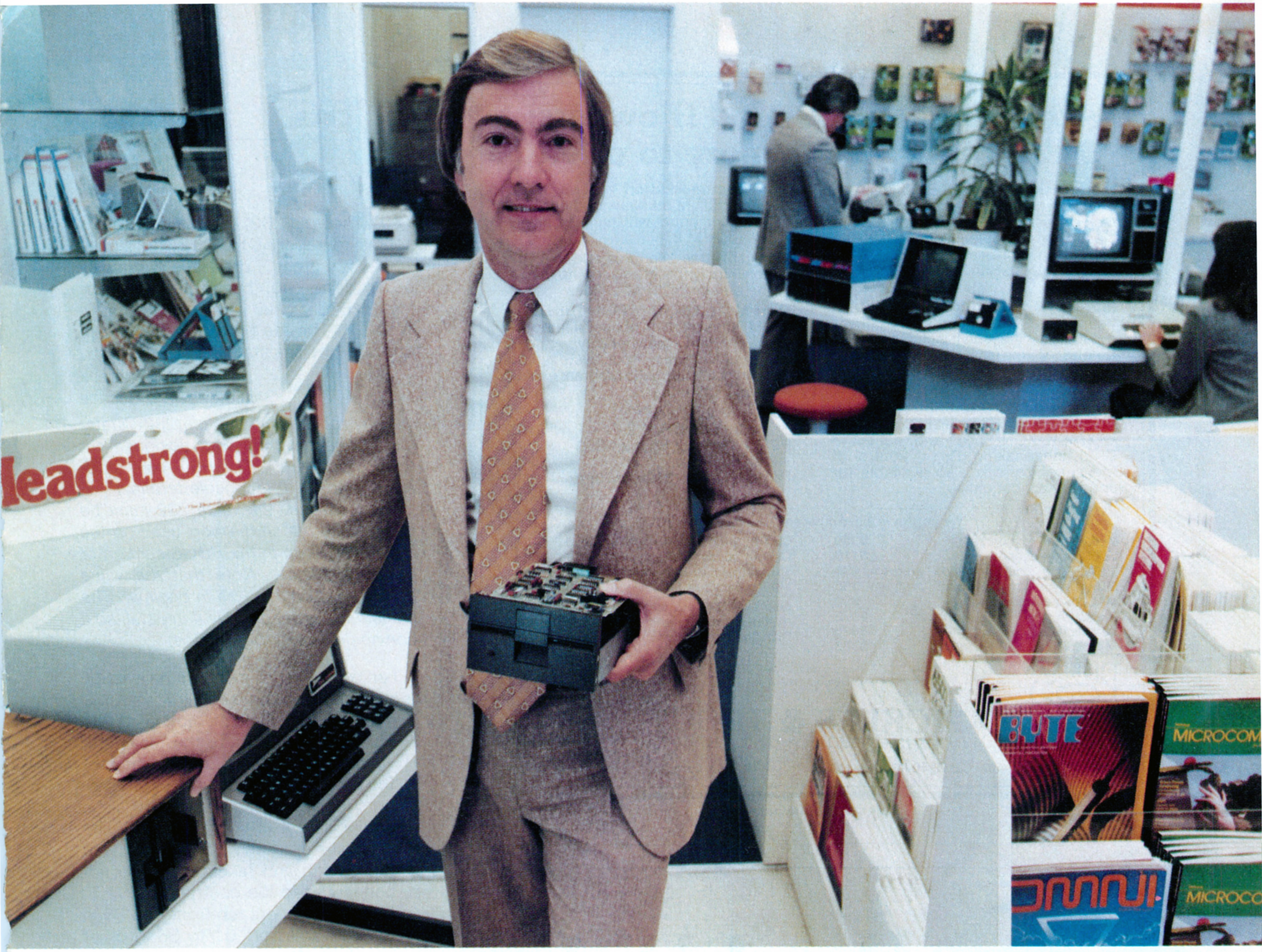
Re Simple Linear Regression (IA Aug 80), Richard Parry's concise exposition, with such a well documented program, was a joy. I did not curse Parry once during the lengthy keying-in session, although I had to kick myself three times for typing errors. (Like a fool, I used the text editor and, naturally, had load problems with extended Basic. I still do not like it.)

Nothing, least of all a program, is ever perfect; I wish I could offer some constructive criticism. The only feeble suggestion I can make is that a few more constants may not have gone astray to save the computer a bit of computational effort. On the other hand, extended Basic doesn't seem to blink; so, if it doesn't complain, why should I?

Greg Wilson
Potts Point, Australia

More flight turbulence

I thoroughly enjoyed the "Fly Your Computer" program (IA Aug 80) by Thomas Carbone. I have a Heathkit H89 (48K). When I typed in the program, I found a problem with 'Control bas.' I have traced the problem to line 140-



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CIRCLE INQUIRY NO. 76

160. The 'pin(232)' statement always seems to report C1 = 13, no matter what key I press. I crash the aircraft by going to line 700, then 720, then 1320. My B.H. Basic is version 100.05.00. Would this be the problem? I would appreciate any assistance.

Vernon Schrank
Saskatchewan, Canada

The problem is in the 'pin(232)' statement. The program was designed for the H8 computer. The H89 uses a different port for the console terminal.

To correct it, the value 232 must be changed to match the port used on the H89. Look it up in the HDOS section of the H89 manual. Note that the value used with 'pin' must be in decimal. The manual will probably give it in octal, so a conversion might be needed.

I enjoyed the program but the aviation technology was the weak link:

1. The forward and aft motion of the control wheel affects the elevators, which have an effect on the pitch of the airplane (shown on the pitch readout of the artificial horizon). The author said it affects the flaps. The flaps are drag and lift devices used for landing and takeoff and are not connected to the control wheel.
2. Runway numbers run from 1 to 36 in the U.S and from 01 to 36 in other countries. If one multiplies the runway number by 10 it is approximately the magnetic heading of the runway. The author refers to runway 45 and 90 in his program. This would be a heading of 450° and 900°. Obviously, he forgot to divide by 10.
3. The author requires that the airplane must roll (bank) on the ground to turn while taxing out to the runway. Sorry. The airplane must remain level with the ground while taxing.
4. The abbreviations used were not the ones normally used. VSI called VSP and others are close but not correct.
5. I have not flown as pilot in a Boeing 747, but I once flew a Boeing 747 simulator and have many times been a passenger on a 747. I don't think the air speed would be MPH, as knots are used on almost all transport category airplanes and now are common on light aircraft.

I was, however, impressed with the computer use of the H19 (H89) graphics.

My analogy to this article is an aviation magazine writing about computers and explaining to readers that the computer term byte refers to the teeth of the computer.

David L. Horwitz
Wichita, KS

Whatever happened to eenie, meenie, miney, mo?
This may put the Godfather out of business.
I could be another Solomon...
If only my heart would stop racing...
It must use Bayesian, weighted factor analysis, and...
Brilliant! Like a window into the future.
...a perfect gift for that urban cowgirl!
Maybe this'll help me choose a career...
Would I rather have Winston's millions or Billy Joe's love?
I could use it to select my staff.
Hmmmm... could be my ticket to the Boardroom.
The decision is...
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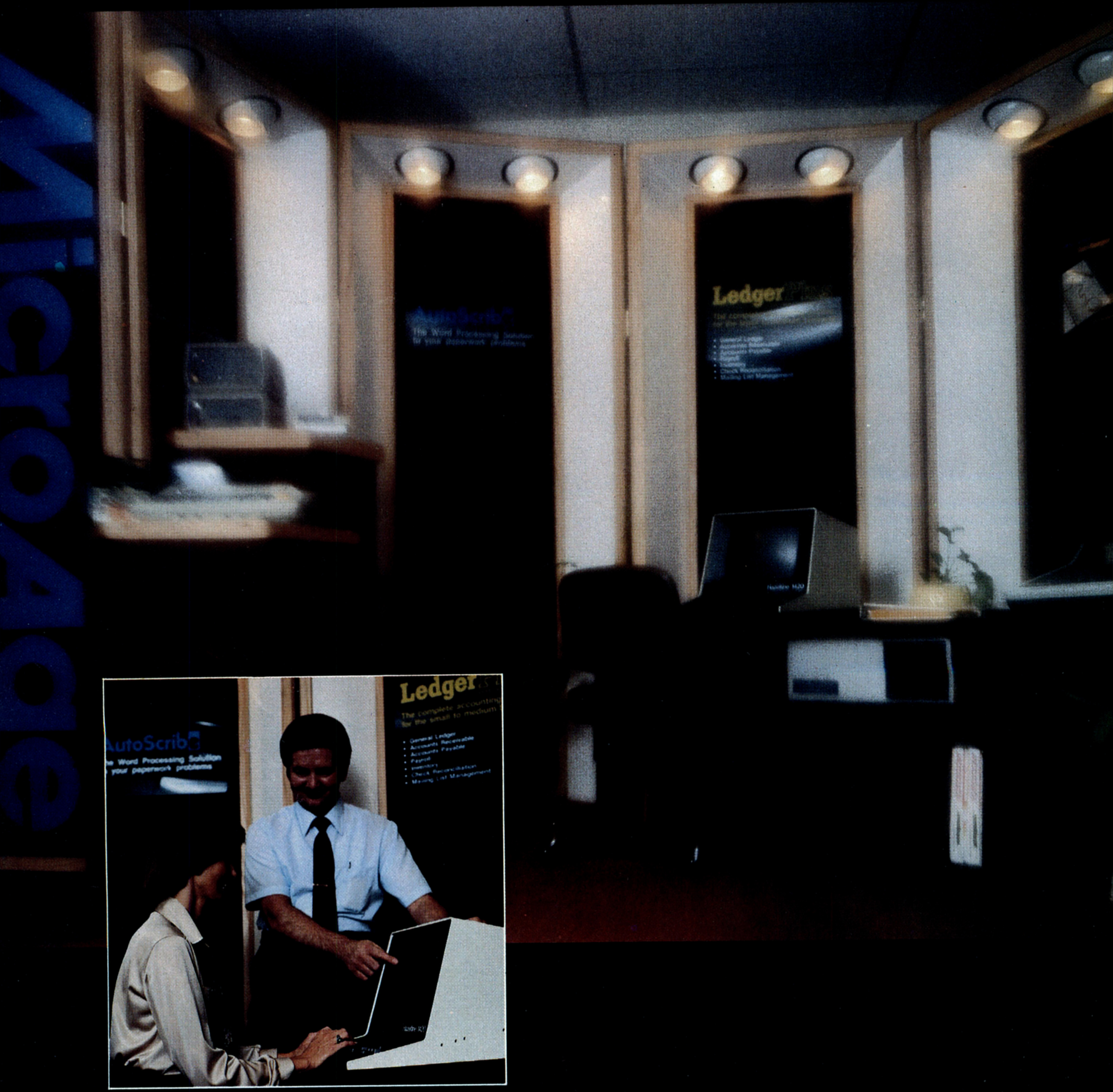
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CIRCLE INQUIRY NO. 96

Voice-activated typewriter a reality by 1983

Faster-than-expected progress in the development of speech recognition technology will produce voice-activated typewriters by 1983, and they will be in widespread use by the end of the decade, according to the market research firm International Resource Development Inc. A competitive battle is expected to develop among IBM, Xerox and Matsushita for consumer dominance in the mid-1980s. More than one million typists and secretaries will be redeployed—or unemployed—as a result.

The prototypes will reportedly recognize about 95% of "typical" business English as spoken by the average executive. The first IBM units, expected in 1983, will have a CRT screen to display the words as they are spoken. The dictator—or more likely his secretary—will type in those words the machine failed to recognize.

The English language is replete with homonyms and synonyms that make 100%-accuracy almost impossible; however, the typewriters will be programmed to recognize these figures of speech and highlight them for correction.

Languages more phonetic than English will be much easier to use in speech recognition; Matsushita's system (also expected in 1983) will do a better job in Japanese than IBM's machine will do in English.

Microprocessor credit cards under study by researchers

The future for credit cards with built-in microprocessing computers will be examined by Battelle Memorial Institute. According to Richard J. Darwin, who heads electronic funds transfer research, these "memory cards" could revolutionize payment and transaction systems; for instance, by industry, government, retail stores, libraries, or hospitals for payment service, record management, ticketing, or inventory control.

Developed in Europe, the wallet-size credit cards contain microprocessors or other electronic circuits with built-in memories and logic functions. Capable of replacing cash and other forms of payment methods in a secure way without using large computer networks, the cards will be introduced in pilot marketing projects in Europe.

The Battelle study, sponsored on a multiclient basis, will forecast through 1990 the market for the cards by application and by geographic location. The study is designed for bankers, retailers, or other organizations interested in using the memory cards, as well as for suppliers of computers, plastic cards, and terminal equipment.

During the study, researchers will analyze the technical possibilities for memory cards, forecast likely developments, and determine how such cards can be used. In addition, they will investigate the technical standards necessary for providing quality cards, determine costs involved, and examine the procedures for patents and licensing. Special emphasis will be placed on how organizations can evaluate the intelligent memory cards to assist in their strategic planning.

In conducting the study, researchers will extensively review data on the new technology, and they will interview a

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I'm Irwin Taranto, and times have changed.

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You can buy my TRS-80 systems all over the country—dozens of companies sell them. Some are my dealers, some aren't. And this creates a new set of problems.

You see, learning to use a computer—any computer—is like learning anything else. It takes some getting used to. If you sit down with a computer program and the manual and try to figure it out all by yourself, you'll probably just give up and feel you've been had.

You have to hang in there for a month, make a few phone calls, and have somebody who really understands the system help you work it out.

That's why I still answer the phone. And why, I guess, people say all those nice things.

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FCC rules on computer noise to raise cost of power

Federal Communication Commission regulations on noise that go into effect in 1981 will probably raise the price of switching power supplies by 5 to 15%, depending on the power rating.

The ruling went into effect for home computer equipment on January 1. For all other computing devices, compliance is required by October 1, 1981 for new products, and by October 1, 1983 for products sold before October 1, 1981.

The ruling affects both radiated and conducted noise and represents an effort by the FCC to control computer equipment interference with radio and television reception.

Manufacturers which will be most affected are those with products that use pulse width modulation, especially mainframe computers, motor speed controllers and switching power supplies.

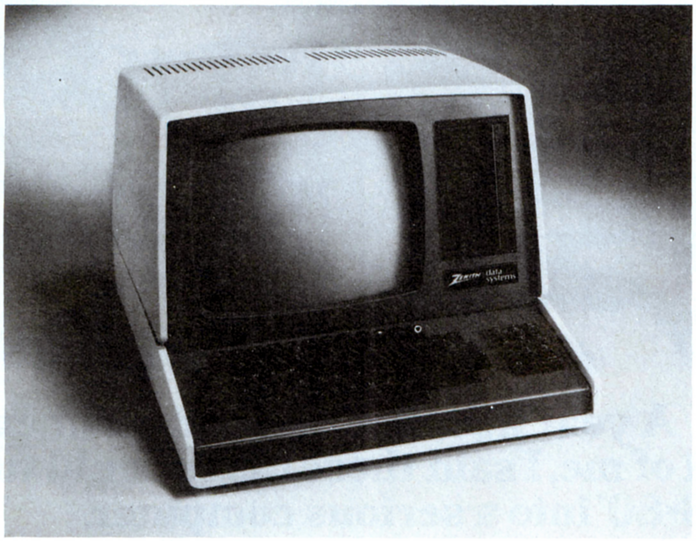
Computer technology holds great education potential

In the past 30 years, computers have had an enormous impact—from putting men on the moon to keeping football statistics. Now they are being used for programs of individualized instruction in education.

The University of Southern California's instructional technology department is developing the Plato system of computerized instruction.

The Plato system operates on a time-sharing basis, with computer terminals in offices, homes and centers across the country. The terminals are tied into

IA publisher Bob Jones (l) presents the magazine's first award for excellence in the computer field to Dr. Harry F. Garland, president of Cromemco. Jones singled out Cromemco for its "effective and unswerving support...and leadership position in the microcomputer industry." He added that the magazine plans to periodically bestow awards to firms with outstanding achievements. Cromemco entered the micro field in 1976; now it employs over 700 persons and is tripling office and manufacturing facilities.



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Electronic telephone directory becomes reality in France

Some residents of France's popular coastal resort of Saint-Malo no longer "let their fingers do the walking."

Instead, their electronic telephone directory promptly displays the number they need on a screen in their home or office.

Rather than searching through the pages of a bulky telephone directory, they will "instruct" the electronic directory by typing the required information on an alphanumeric keyboard.

Dozens of Saint-Malo residents and businessmen this summer have become pioneers in the first large-scale test of France's plan to completely eliminate conventional telephone directories and the telephone "information" service.

The electronic directory, says the French telephone company, is easier to use, faster—and cheaper.

In lieu of telephone directories, the phone company will provide every customer—private or business—with an electronic terminal. Over the next ten years, it expects to distribute more than 30 million free terminals.

And it will still be cheaper than publishing telephone directories and updating them yearly, says the French telephone company, PTT. It will also be more efficient, because the electronic directory will always be up-to-date.

The terminal, a 9-in black and white screen connected to the telephone, is linked to the data base through the telephone. After a little training, the new tool was readily accepted. Everyone quickly grasped the fact that the electronic directory is no more complicated than a pocket calculator.

The Saint-Malo test is the first of several throughout France.

This year, some 250 terminals will be installed in the Ille et Vilaine region around Saint-Malo. PTT has just requested quotations from four hardware manufacturers to supply the terminals for the Ille et Vilaine trial. The companies were also asked to submit quotations for the production of the 2 million sets eventually to be used in the country-wide project, with manufacture to begin in 1985.

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CIRCLE INQUIRY NO. 18

Jurisprudent computerist

By Elliott MacLennan
Attorney at Law

Patents, Know-how and Trademarks: A Tax Overview

A nation of tinkerers is how someone once described America's early inventors. Today's tinkerers are creating a bundle of legal rights in what can be classified as intellectual property. This column will discuss the federal income tax treatment of certain classifications of intellectual property.

Self-developed patents. In an earlier column, the tax deductibility of business-related research and development expenditures was explored in detail. Summarily, such expenditures are deductible in the year incurred or can be deducted over a five year or longer period. Although one main restriction to deductibility is that the taxpayer must be said to be in the "trade or business" of developing the novel innovation under research, this is generally an easy obstacle to overcome, even for an inventor.

Fixed price sale of a patent. Generally the domestic or foreign sale of a patent for a fixed price (fixed in that it is not measured by the productivity of the patent itself) will produce capital gains treatment to the "holder" of the patent. Capital gains, as opposed to ordinary gain treatment, are clearly preferable to a seller because of the considerably lower rate of tax. Alternatively the patent purchaser can deduct the payment for the patent over its remaining statutory life, for example 17 years. A shorter period of deductibility is sometimes possible to extract from the Internal Revenue Service, but usually it must be shown that the patent has become worthless.

Patent licenses. All intellectual property rights are frequently transferred by a license agreement payable by royalty on productivity or sales volume. The reason for this unique manner of payment is the inability to commercially value a patent as it enters the market. A patent license produces capital gains only if the holder transfers an undivided interest in the patent or "all substantial rights" to it where it has some commercial value at the time of transfer. For simplicity, an exclusive patent license to make, use and sell the patent produces capital gain to the holder, regardless of whether the payment for the patent is fixed or contingent, i.e., a royalty patent.

The exact opposite is true for a nonexclusive license: ordinary income will result. Substantial business judgement enters into whether capital gains or ordinary income should be targeted. The holder may wish to hold back several substantial rights for future exploitation. Moreover the holder may want to provide an opportunity to several manufacturers to exploit his or her invention, not wishing to rely on any one company.

Individual investors. The Internal Revenue Code, Section 1235, provides special incentives to amateur or professional noncorporate inventors. At the risk of being redundant, an individual can qualify as a holder even if he or she has never before commercially sold or licensed a patent. Who can be a "holder"? It is the individual who invented or financed the invention prior to its introduction to practical usage. The financier cannot be the employer of the inventor nor related to the inventor.

Know-how. This is not subject to precise definition. It is information that gives a competitive advantage to a business. Its forms are many: operational instructions, plant setup, secret processes, trade secrets, etc.

Self-developed know-how. Like patents, its cost expenditures are deductible when the taxpayer-researcher can show to the satisfaction of the IRS that he or she is in the "business" of producing such know-how. Being in the trade or business of producing know-how is, as can be imagined, a semantic problem.

Generally, the courts have been more lenient in favor of the taxpayer than has been the IRS. The IRS prefers to contest the deductibility of what commonly are called "start-up" operations by individuals making their first foray into developing intellectual property for ultimate realization of commercial gain.

Fixed price sale of know-how. To the individual, know-how sales produce capital gains treatment. This is the same as a patent. One critical distinction for a purchaser of know-how as opposed to the purchase of a patent is that, unless the know-how can be shown to have some reasonable ascertainable useful life, the purchaser cannot deduct payments made to its producer. Demonstrating useful life is rare except in high technology - rapid obsolescence situations.

Know-how licenses. An exclusive license like a patent produces capital gains. However, the stumbling block again is that licenses of know-how producing capital gains are not deductible by a purchaser of the know. Sometimes when know-how is being transferred in connection with a patent, it can be deductible if it is merely incidental to the transfer of the patent (piggybacking). A nonexclusive license of know-how permits a deduction to the purchaser for payments made to the know producer. The price to the purchaser for obtaining deductibility: income from the know-how is taxable at higher ordinary tax rates.

Trademarks. This includes names, marks, symbols and devices that distinguish and identify one businessman's goods or services from another.

Self-developed trademarks. Certain trademark-incurred expenditures must be spread over five years or lost forever as deductions. Examples would be legal expenses and filing costs in procuring or defending the trademark. More significantly, however, is that substantial advertising and promotional expenditures are currently deductible to a taxpayer engaged in a trade or business. No special election must be filed for such deductions.

Sale of trademarks. A fixed price sale will produce capital gains. Again, advantageous tax treatment favoring the trademark seller disfavors the purchaser. The purchaser cannot deduct the payments made to the seller. Reverse the situation. Make the trademark payments contingent or "earned-out." This produces ordinary income to the seller but allows the purchaser a business deduction. Where both seller and purchaser candidly address their respective tax brackets and tax situation, determining how to design the sale can produce benefits to both at the expense of the IRS.

Trademark licensing. Generally the income realized by the trademark licensor is ordinary and not capital in nature. Trademark payments are contingent and not fixed, but more ordinarily the trademark owner licensing the mark retains significant rights militating against capital gains treatment. The most significant right is that the trademark licensor wants to have input and modification powers to the quality of the product or service in order to protect the commercial integrity of the trademark.

The protection of intellectual property, its taxation and commercial exploitation, requires sensitive and forward thinking business judgement in the sale, purchase and license of these unique and valuable property rights. Planning ahead for anticipated tax treatment can enhance the value of the property right to its developer, acquirer, or user. ☐

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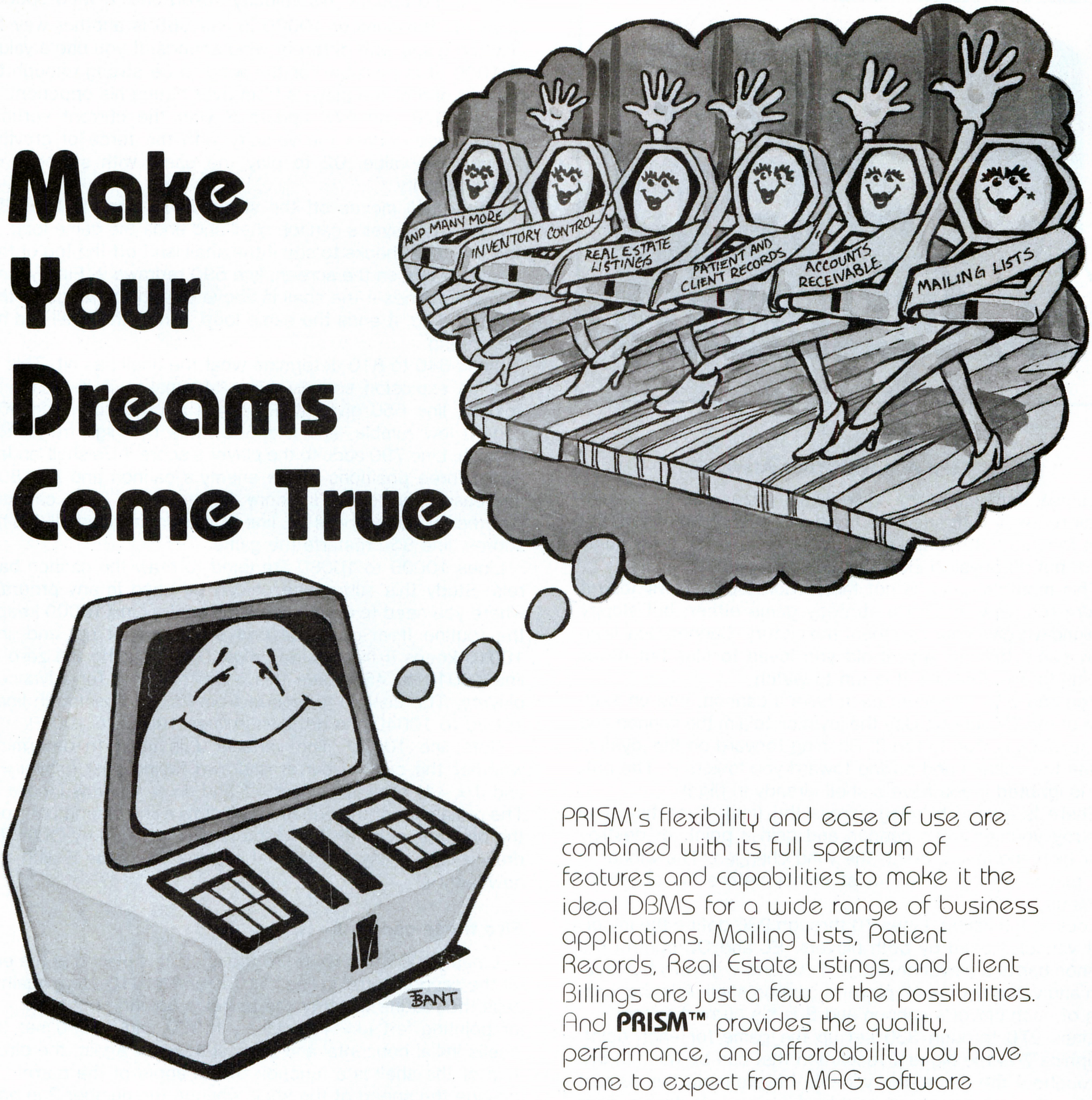

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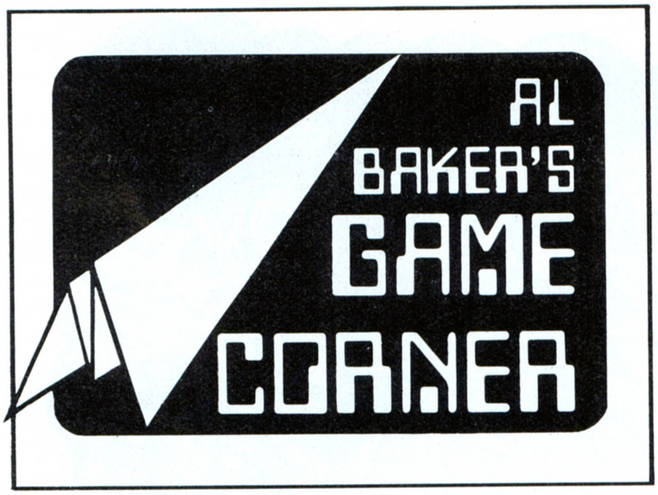

Take Aim with Your Atari

Games come in many shapes and sizes. Some require quick reflexes with accurate hand and eye coordination, but little thought. Others are strategy games and require a quick mind, but no physical skills. Others require both.

This month's game is not fast action, but you will lose if you're too slow. It isn't a strategy game either, but sloppy thinking will give your opponent the victory. Cannon Dual is an Atari game that my 4-year-old son loves to play but never seems to win. For him, it is fun to watch.

You and your opponent each have a cannon, one on each side of the TV screen. Use the joystick to aim the cannon and the joystick button to fire it. Pushing forward on the joystick raises the cannon and pulling toward you lowers it. The button is ignored if you have a shell already in flight.

There is a wind blowing across the field. Each time you destroy your enemy's cannon and gain a point, or destroy your own and lose a point, the wind changes. The winner is the player who gets the most points before his opponent gives up.

Look at the listing. Lines 70 through 230 define the important variables used by both players. EL and OL control the cannon barrel's elevation and X, Y, U, and V govern the location and velocity of each player's cannon shell. P is the location of each player's cannon and S is his current score.

Lines 270 through 330 set up the game for each point. Graphics 7 is the highest resolution that can be used in 8K. Throughout the game, the variable I represents the current player (0 or 1) and the variable J represents the current player's direction. J is −1 for player 0 and J is +1 for player 1. How J is used will be described later. The wind velocity in line 310 can be anything from −25 to +25. Change this line if you like to play with higher or lower wind speeds.

Lines 370 and 380 form the main game loop that ends on line 850. Inside the loop, the program takes turns looking at player 0 and player 1. It continues this until one or the other player succeeds in hitting a cannon.

The joysticks are read and used in lines 420 to 480. If the player's joystick is upright, no action is taken. If not, the cannon's elevation is increased if JS is 14 (pushed forward) or decreased if JS is 13 (pulled back). The subroutine at line 10000 erases the cannon at its old elevation and redraws it at the new.

Line 480 takes care of pushing the button. If there is no shell for the player (X = 0) and the trigger is pushed (strig = 0), the subroutine at line 11000 is called.

The remainder of the game loop moves the cannon shells through the air. If the player has no shell, line 520 skips these instructions and ends the game loop. Otherwise, lines 530 and 540 erase the bullet if it isn't off the top of the TV screen. Lines 560 to 575 compute the physics that make the game work. Lines 560 and 565 update X with the current horizontal velocity and update this velocity based on the wind speed. Changing the number 10000 in line 565 is another way to play the game with different wind speeds. If you use a value of 1000, it is possible for the wind to be strong enough to prevent one of the players from ever hitting his opponent.

Lines 570 and 575 update Y with the current vertical velocity and update the velocity with the force of gravity. Change the value .02 to play the game with stronger or weaker gravity.

If the shell moves off the sides of the screen, line 580 cancels the player's cannon shell and ends the game loop. If not, line 590 checks to see if the shell isn't off the top of the screen. If it is on the screen, line 590 redraws it. Finally, line 600 determines if the shell is above the bottom edge of the screen. If so, it ends the game loop. If not, the shell has hit the ground.

Lines 640 to 810 determine what the shell has hit. This is how an explosion sounds. Line 640 makes it decrease in volume, line 650 gives it a medium pitched roar, line 660 adds a low rumble, and line 680 adds the high frequency whoosh. Line 790 adds to the player's score if his shell landed within three positions of his enemy's cannon and line 800 decreases the player's score if he hit his own cannon. Whether or not one was hit, line 805 cancels the shell. If a hit scores, line 850 restarts the game.

Lines 10000 to 10080 are used to draw the cannon barrels. Study this subroutine. It can be used in any program where you need to draw a line at an angle. Line 10000 keeps the routine from going beyond 90° (straight up) and line 10010 keeps it from going below 0°. Changing the zero in line 10010 to 45 makes this a better game for advanced players. The cannon is erased from its old position in lines 10020 to 10040 and redrawn in lines 10050 to 10070.

Note line 10040. The variable J is used to determine whether the cannon barrel is drawn facing east (player = 0 and J = −1) or west (player = 1 and J = +1). Now ignore J. The remainder of the equation will draw a line of length 5 from the previous point (P,79) at the angle specified by OL(I). To draw a line of any length, just replace the value 5 with the new length.

Fire those cannons

Lines 11000 to 11090 fire the shell. It is placed at the end of the cannon barrel in lines 11000 and 11010. Here again, J tells the routine whether the barrel is pointing right (J = −1) or pointing left (J = +1). Lines 11020 and 11030 set the shells initial horizontal and vertical speeds. Again, the direction of the shell is a function of the angle of the barrel. To change the speed of the shell, change the number 2 in both lines to another number.

The remaining lines of the routine create the sound of the cannon firing. Lines 11050 and 11070 create the sharp pop sound created by the exploding powder and lines 11060 and 11090 form the decreasing roar.

I enjoy the mail I receive from you and I try to answer every letter. If you haven't received a reply, and too much time has passed, please write again.

I have received several letters in response to the program Orbits (IA Aug 80). The most interesting was from Steve Steinberg. He added several improvements to the program, replacing the 'color 4' statement in line 210 with 'color 3'. He wrote, "I enjoy watching the trail of the orbiting objects..." and this change "produces an attractive enough light blue trail that doesn't interfere with watching the basic plot of the yellow dots."

He also increased the graphics resolution and developed the numbers to simulate the sun and major planets of the solar system. Unfortunately, Mr. Steinberg didn't include his address. If you are reading this, Steve, please send me the input data for your solar system simulation so I can share it. ☐

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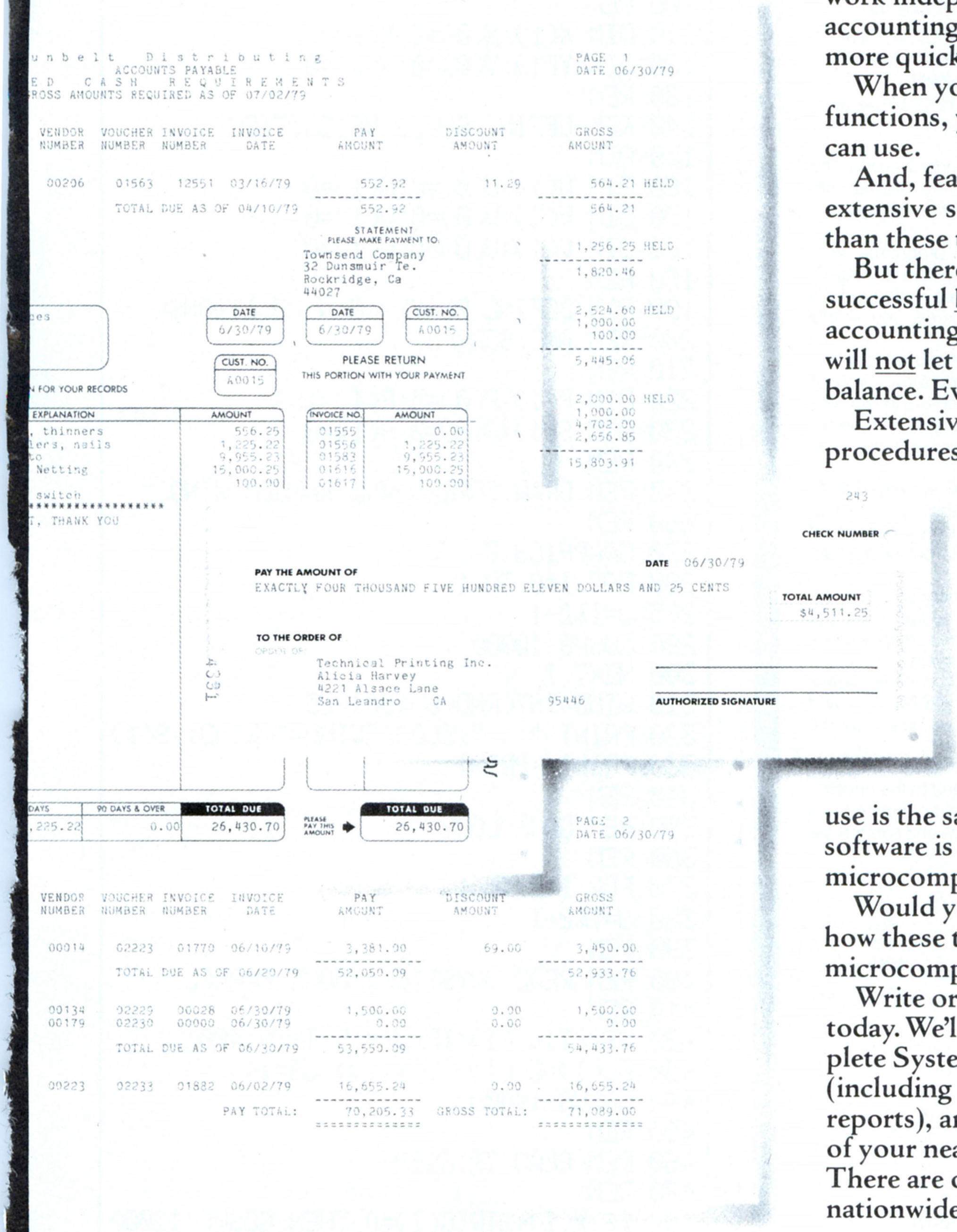

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  00179   02230   00000  06/30/79        0.00           0.00            0.00
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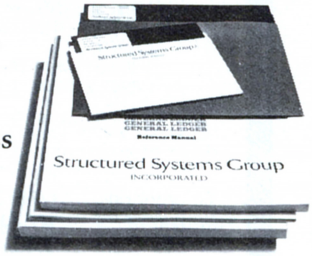

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CIRCLE INQUIRY NO. 72

Program listing

```
10 REM ... CANNON DUEL ...
20 REM
30 REM
40 REM DEFINE GUN STARTING ELEVATION
50 REM
60 DEG
70 DIM EL(1):EL(0)=45:EL(1)=45
75 DIM OL(1):OL(0)=0:OL(1)=0
80 REM
90 REM DEFINE PLAYER SHELL POSITIONS
100 REM
110 DIM X(1):X(0)=0:X(1)=0
120 DIM Y(1):Y(0)=0:Y(1)=0
130 REM
140 REM DEFINE SHELL VELOCITIES
150 REM
160 DIM U(1):U(0)=0:U(1)=0
170 DIM V(1):V(0)=0:V(1)=0
170 DIM V(1):V(0)=0:V(1)=0
180 REM
190 REM DEFINE PLAYER GUN POSITIONS
200 REM AND SCORES
210 REM
220 DIM P(1):P(0)=5:P(1)=154
230 DIM S(1):S(0)=0:S(1)=0
240 REM
250 REM DRAW SCREEN AND RANDOM WIND
260 REM
270 GRAPHICS 7
280 FOR I=0 TO 1
285 J=I*2-1
290 GOSUB 10000
300 NEXT I
310 WIND=INT(RND(0)*50)-25
320 PRINT "    ";S(0),"WIND=";WIND,,S(1)
330 PRINT :PRINT
340 REM
350 REM GAME LOOP
360 REM
370 FOR I=0 TO 1
380 J=I*2-1
390 REM
400 REM READ JOYSTICK; MOVE BARREL
410 REM
420 JS=STICK(I):IF JS=15 THEN 480
430 EL(I)=EL(I)-(JS=13)+(JS=14)
440 GOSUB 10000
450 REM
460 REM READ TRIGGER
470 REM
480 IF X(I)+STRIG(I)=0 THEN GOSUB 11000
490 REM
500 REM MOVE SHELLS
510 REM
```

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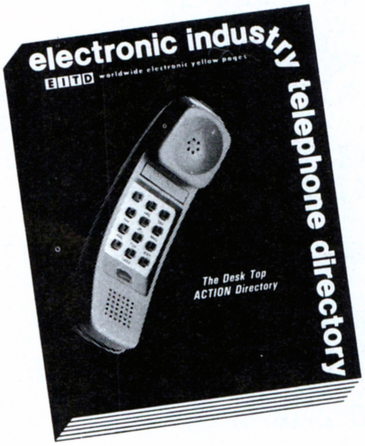
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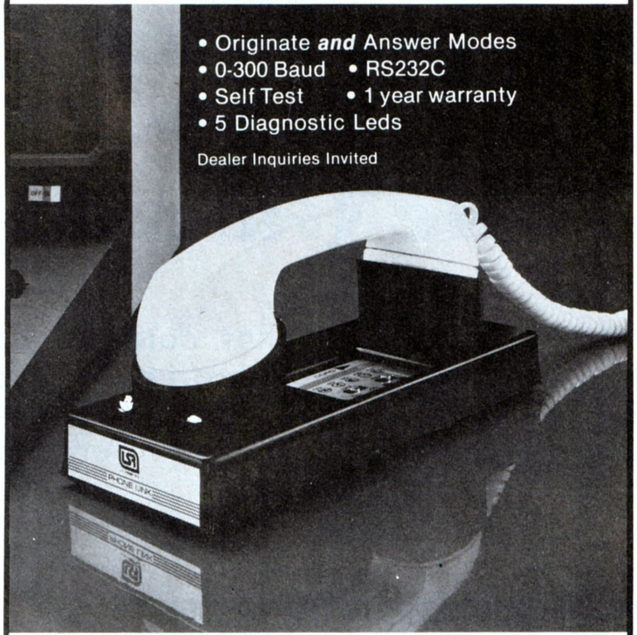

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CIRCLE INQUIRY NO. 9

```
520 IF X(I)=0 THEN 850
530 COLOR 0
540 IF Y(I)>=0 THEN PLOT X(I),Y(I)
550 COLOR 1
560 X(I)=X(I)-U(I)
565 U(I)=U(I)-WIND/10000
570 Y(I)=Y(I)-V(I)
575 V(I)=V(I)-0.02
580 IF (X(I)<1)+(X(I)>159) THEN X(I)=0:G
OTO 850
590 IF Y(I)>=0 THEN PLOT X(I),Y(I)
600 IF Y(I)<79 THEN 850
610 REM
620 REM SHELL HIT -- ON TARGET?
630 REM
640 FOR K=15 TO 0 STEP -0.3
650 SOUND 0,100,0,K
660 SOUND 1,250,10,K
670 SOUND 2,10,8,K
680 NEXT K
790 IF ABS(P(1-I)-X(I))<3 THEN S(I)=S(I)
+1:K=1
800 IF ABS(P(I)-X(I))<3 THEN S(I)=S(I)-1
:K=1
805 X(I)=0
810 IF K=1 THEN I=1:NEXT I:GOTO 270
820 REM
830 REM LOOP GAME
840 REM
850 NEXT I:GOTO 370
9970 REM
9980 REM ERASE AND DRAW BARREL
9990 REM
10000 IF EL(I)>90 THEN EL(I)=90
10010 IF EL(I)<0 THEN EL(I)=0
10020 COLOR 0
10030 PLOT P(I),79
10040 DRAWTO P(I)-J*5*COS(OL(I)),79-5*SI
N(OL(I))
10050 COLOR 1
10060 PLOT P(I),79
10070 DRAWTO P(I)-J*5*COS(EL(I)),79-5*SI
N(EL(I))
10080 OL(I)=EL(I):RETURN
10970 REM
10980 REM PUT SHELL ON SCREEN
10990 REM
11000 X(I)=P(I)-J*5*COS(EL(I))
11010 Y(I)=79-5*SIN(EL(I))
11020 U(I)=J*2*COS(EL(I))
11030 V(I)=2*SIN(EL(I))
11040 SOUND 0,10,10,15
11050 SOUND 1,100,8,15
11060 FOR K=15 TO 0 STEP -1
11070 SOUND 0,0,0,0
11080 SOUND 1,100,8,K
11090 NEXT K:RETURN
```

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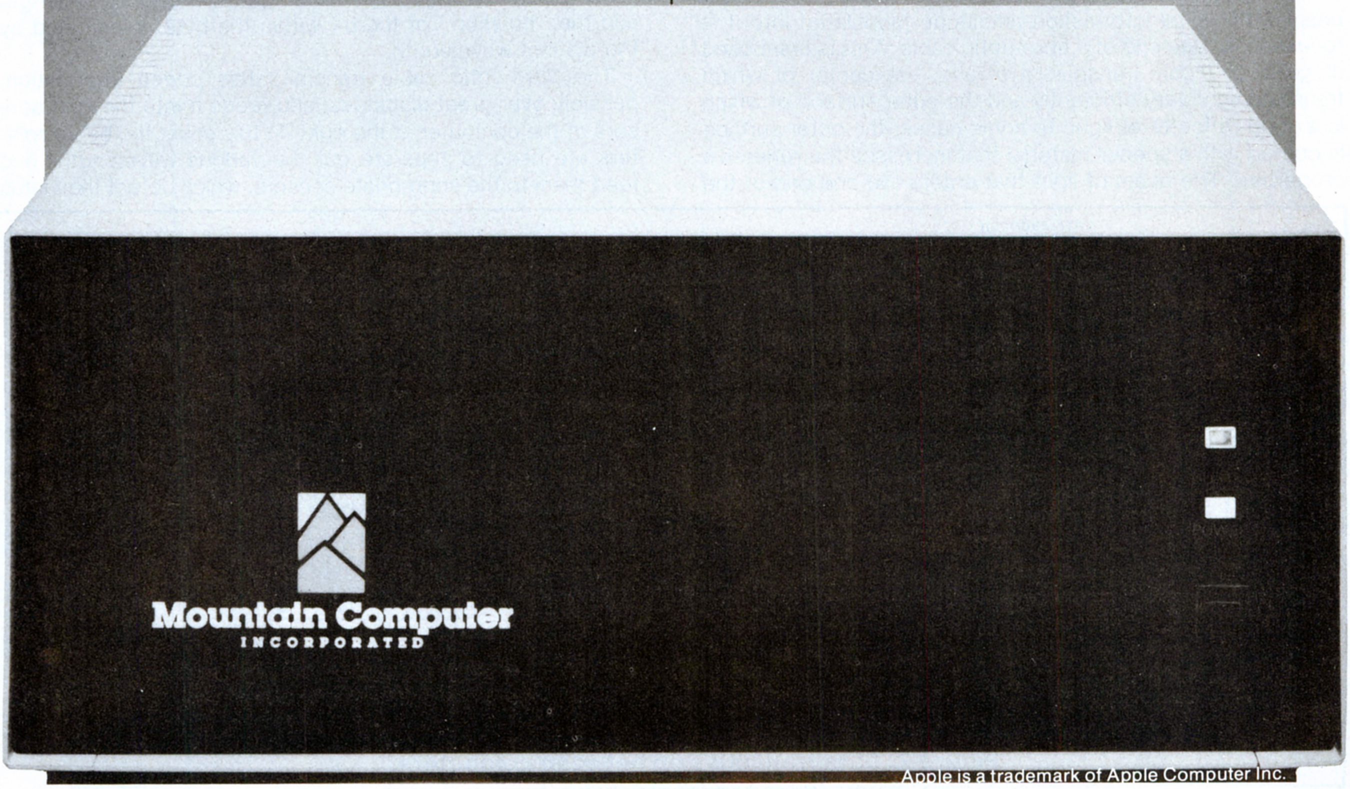

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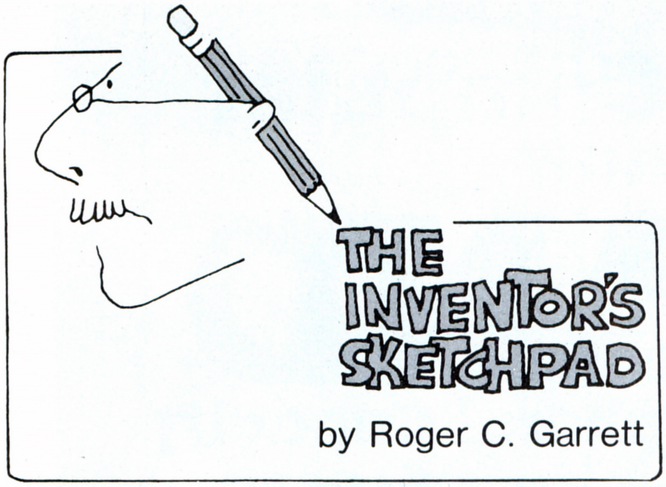

THE INVENTOR'S SKETCHPAD

by Roger C. Garrett

A Look Into Fibre-Optics

As computer communication needs have increased, so has the need for a more efficient and reliable transmitter of information. Electrical transmission via normal metal wires was not sufficient, so other methods were sought. It seemed reasonable to look to light itself as the information carrier and, after several years of research, fibre-optics are now becoming commercially available as the "cable" through which the light is transmitted.

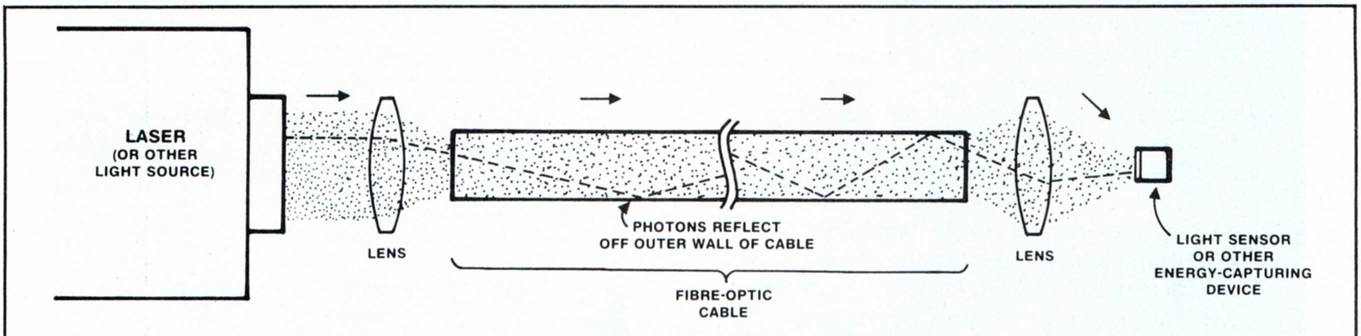
LASER (OR OTHER LIGHT SOURCE)
LENS
PHOTONS REFLECT OFF OUTER WALL OF CABLE
FIBRE-OPTIC CABLE
LENS
LIGHT SENSOR OR OTHER ENERGY-CAPTURING DEVICE

Figure 1. Fibre-optic transmission.

In the typical fibre-optic transmission (figure 1), a laser beam with digital information amplitude modulated into it is focused into one end of a fibre-optic cable. This is composed of glass or highly transparent plastic, the center of which transmits light very efficiently and the outer surface of which is a good reflector of light. In some cases, the outer surface is coated with a special material that increases the reflective properties. The beam of light that enters the one end of the cable is therefore transmitted to the other end without loss of information, even if the cable is bent or twisted. Typical cables may be up to a mile or more in length with little loss in energy. This, however, is more a function of current production techniques than any inherent quality of fibre-optics. It should be reasonable to expect that we will see longer and longer cable lengths as technology matures.

One increasingly common application of fibre-optics is in the transmission of information between computers. Starting from the left-hand side of figure 2, we see a computer sending output data in parallel (2 or more bits at a time) to a data encoder. This encoder splits the parallel data into individual bits (but still parallel) and appropriately modifies the output of an individual laser for each of these bits.

For example, if a data byte consists of 00101101, the output of one laser would be set to off (corresponding to the leftmost bit), the next laser would be off, the next laser to on (third bit from the left), and so on.

The light-energy output of each laser feeds into the fibre-optic cable by means of a set of beam splitters, which in this case function as beam combiners. It may appear here that the various bits, encoded as on and off beams of light, would all be combined into one undecodable level of light intensity and that perhaps some form of time multiplexing would be required to keep the bits separate.

Such is not necessary because each laser emits a unique and distinct wavelength of light, so that the status of the bit is indicated by the intensity of the light at a given wavelength and the "position" of the bit within the byte is specified by the distinct wavelength.

The fibre-optic cable transmits this coded information, possibly over great distances, and feeds it into the light sensors of the computer at the right. In this case, the beam splitters are used to separate out the various wavelengths and feed them to the appropriate sensors, which detect the status

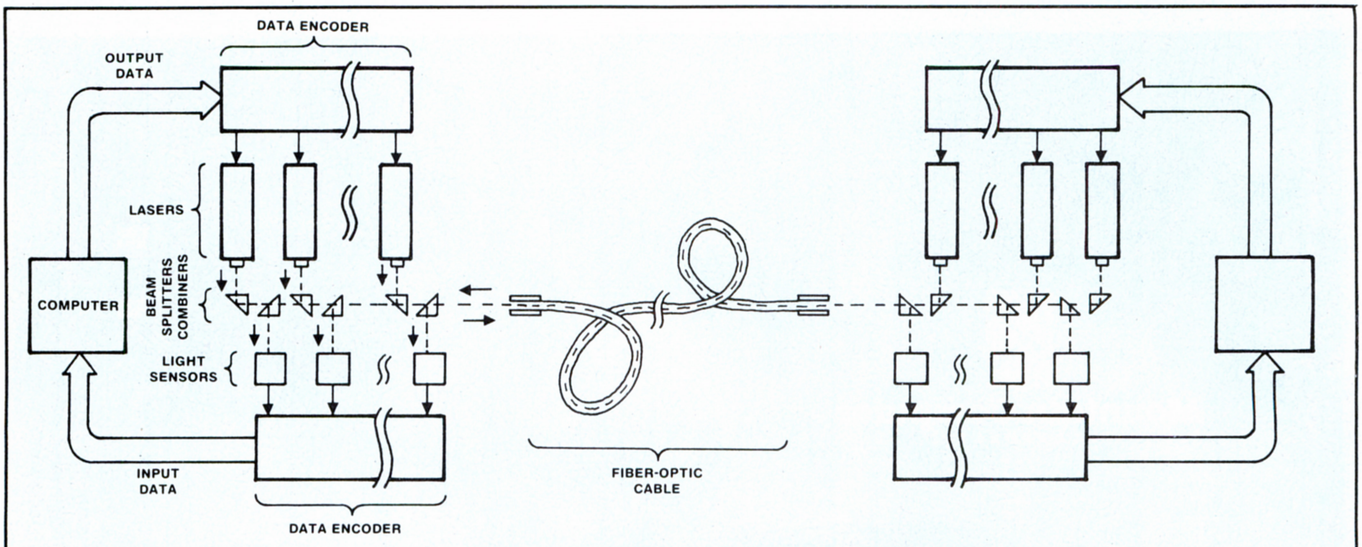

Figure 2. Data transmission between computers.

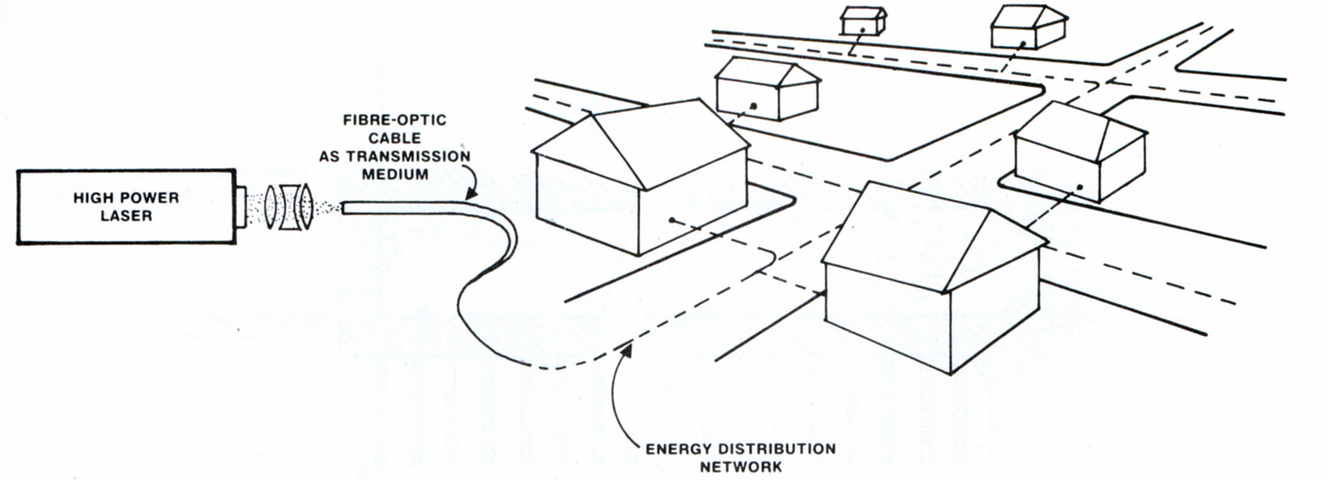
HIGH POWER LASER
FIBRE-OPTIC CABLE AS TRANSMISSION MEDIUM
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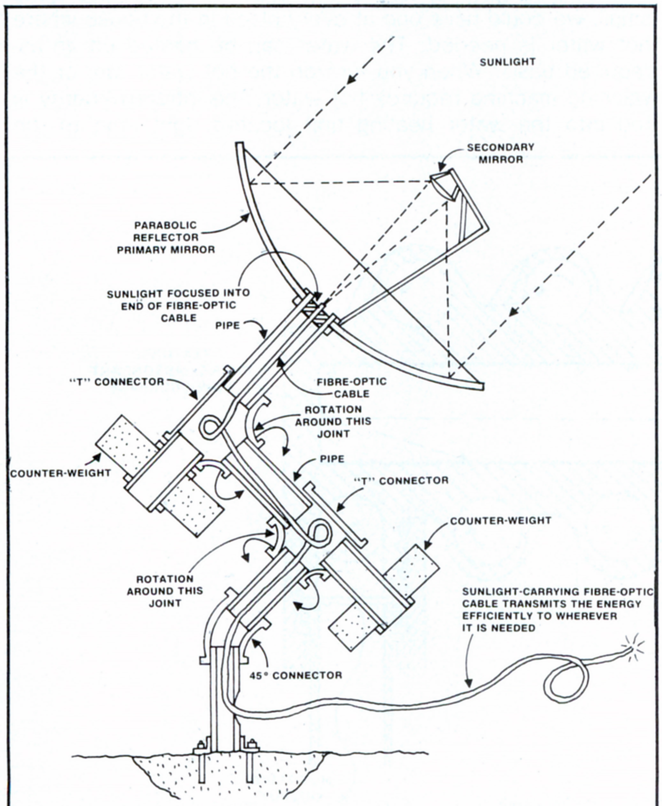
Figure 3. Possible laser/fibre-optic transmission hookup.

of the bits comprising the byte in parallel. The data decoder combines the bits into the byte and sends it to the computer.

Notice, too, that both computers have a set of lasers (data senders) and sensors (data receivers). The fibre-optic cable has the unique ability to send information (light) in both directions at the same time over the same cable.

While many companies are looking into fibre-optics to explore their potential for transmitting information, no one seems to be looking into their use as simple energy transmission cables. Might it not be possible to combine the high-energy laser technology currently being developed for military purposes with fibre-optic technology (figure 3) and produce a centralized energy distribution system for cities and towns?

While we may not be able to use currently available fibre-optic cables, which most likely are not designed to handle such high levels of energy, might it not be reasonable to investigate the feasibility of developing such a cable? We currently distribute energy by requiring that each individual building have its own storage facility and periodically a truck must deliver the fuel oil or natural gas.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PARABOLIC REFLECTOR PRIMARY MIRROR
SUNLIGHT FOCUSED INTO END OF FIBRE-OPTIC CABLE
PIPE
"T" CONNECTOR
FIBRE-OPTIC CABLE
ROTATION AROUND THIS JOINT
COUNTER-WEIGHT
PIPE
"T" CONNECTOR
COUNTER-WEIGHT
ROTATION AROUND THIS JOINT
SUNLIGHT-CARRYING FIBRE-OPTIC CABLE TRANSMITS THE ENERGY EFFICIENTLY TO WHEREVER IT IS NEEDED
45° CONNECTOR

Figure 4. One possibility of converting sunlight to electricity.

Although electric heating essentially uses a "cable delivery system," it is extremely inefficient due to the very nature of electricity and metal cables. It appears to me that transmitting the energy directly in the form of infrared light along highly efficient optical cables is an alternative worthy of investigation.

It might even be feasible to transmit solar energy in its original form (figure 4), as sunlight, directly to where it will be used. Much research is being done on ways to efficiently convert sunlight to electricity so that it can be transmitted to homes where it is then converted back to heat and light via notoriously inefficient appliances. Would it not make more sense to route the sunlight itself directly to the homes and offices, thereby bypassing the energy-consuming conversion processes? I think so.

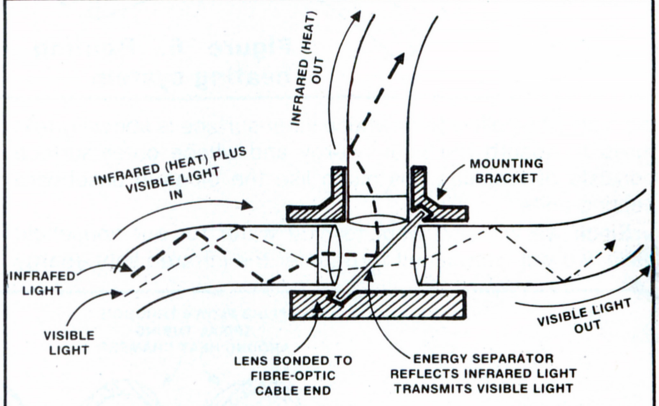
INFRARED (HEAT) OUT
INFRARED (HEAT) PLUS VISIBLE LIGHT IN
MOUNTING BRACKET
INFRAFED LIGHT
VISIBLE LIGHT
VISIBLE LIGHT OUT
LENS BONDED TO FIBRE-OPTIC CABLE END
ENERGY SEPARATOR REFLECTS INFRARED LIGHT TRANSMITS VISIBLE LIGHT

Figure 5. Simple method to separate infrared light from visible light.

The light energy transmitted over these cables (figure 5) will, like the computer systems described above, contain energies at numerous wavelengths including visible and infrared (heat). Since we will want to make use of these varying forms of energy at separate positions around the house or office (we want only visible light from the lighting fixtures and infrared from the heating units), we need a way to separate them. One relatively simple method is with wavelength-distinct mirrors that reflect energy at some specific wavelength or range of wavelengths and transmits (passes through) all other wavelengths. A thin layer of gold, for example, will reflect infrared but transmit visible light.

The infrared carrying cable would then be routed around the house or office to radiators (figure 6) such as this one. It

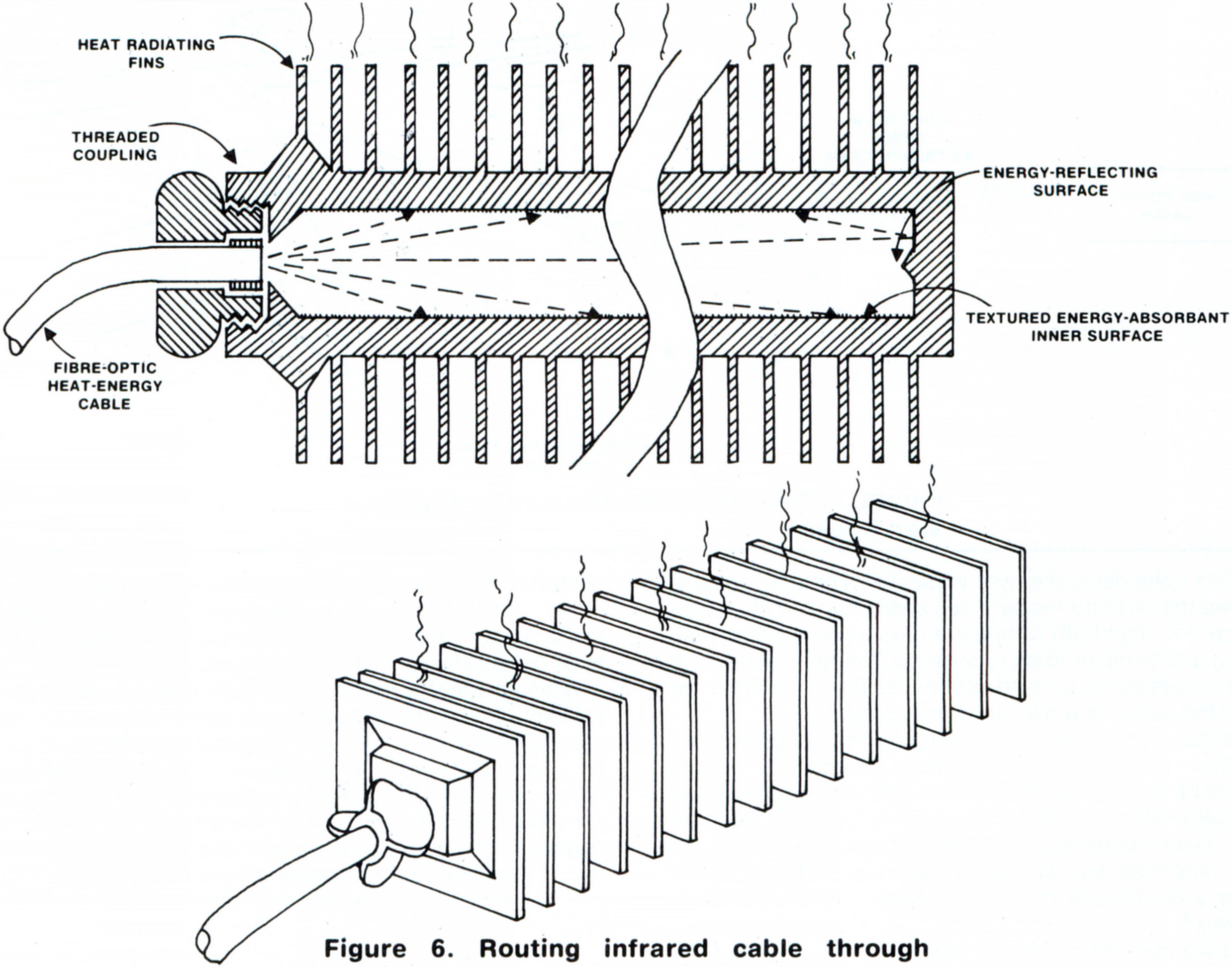
HEAT RADIATING FINS
THREADED COUPLING
ENERGY-REFLECTING SURFACE
TEXTURED ENERGY-ABSORBANT INNER SURFACE
FIBRE-OPTIC HEAT-ENERGY CABLE

Figure 6. Routing infrared cable through heating system.

consists of a hollow tube whose inner surface is specially textured to absorb the heat energy and whose outer surface consists of radiating fins much like the pipes in baseboard heating units.

Since we will also want to heat water for our household uses, we will need a unit to transfer the infrared light energy into water (figure 7). Since this unit could be made quite small, we could have one at every place in the house where hot water is needed. The water can be heated on an as-required basis. When you turn on the hot water tap, or the washing machine requires hot water, the infrared energy is fed into the water heating unit located right next to the

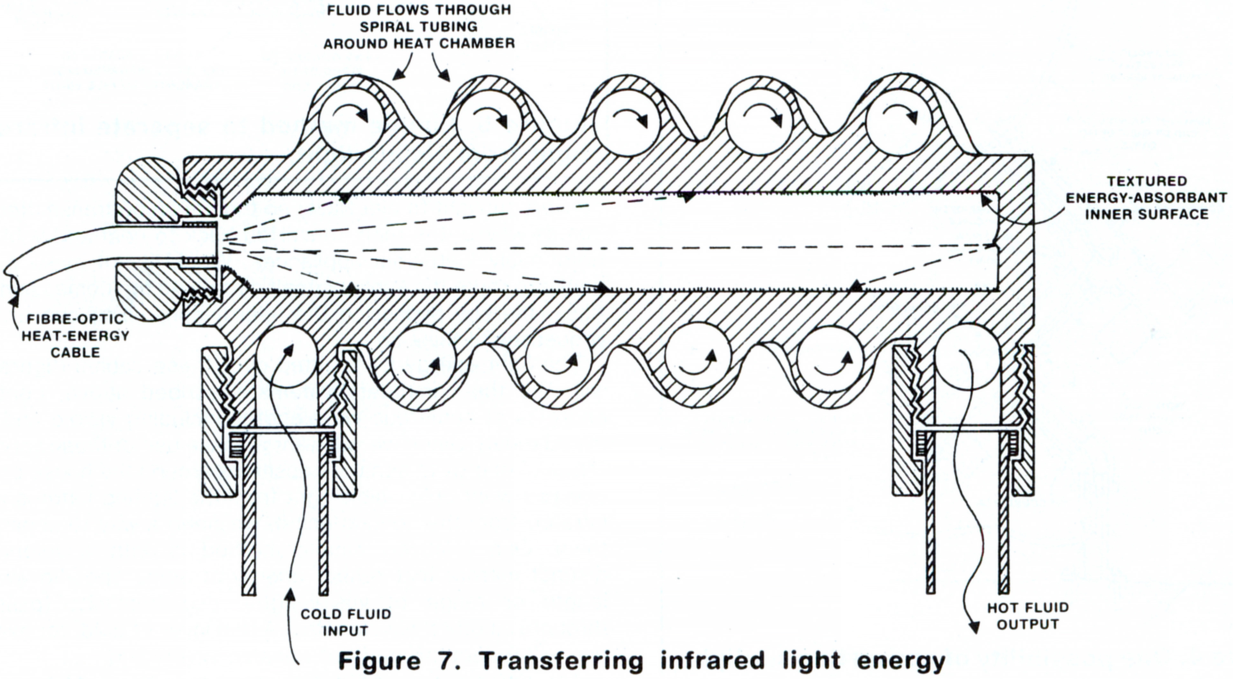
FLUID FLOWS THROUGH SPIRAL TUBING AROUND HEAT CHAMBER
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Figure 7. Transferring infrared light energy into water.

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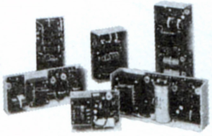

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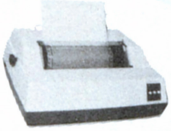

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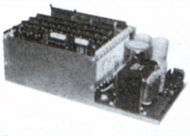

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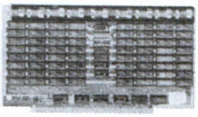

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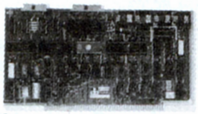

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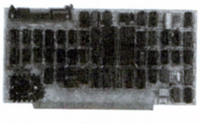

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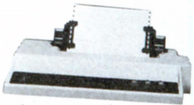

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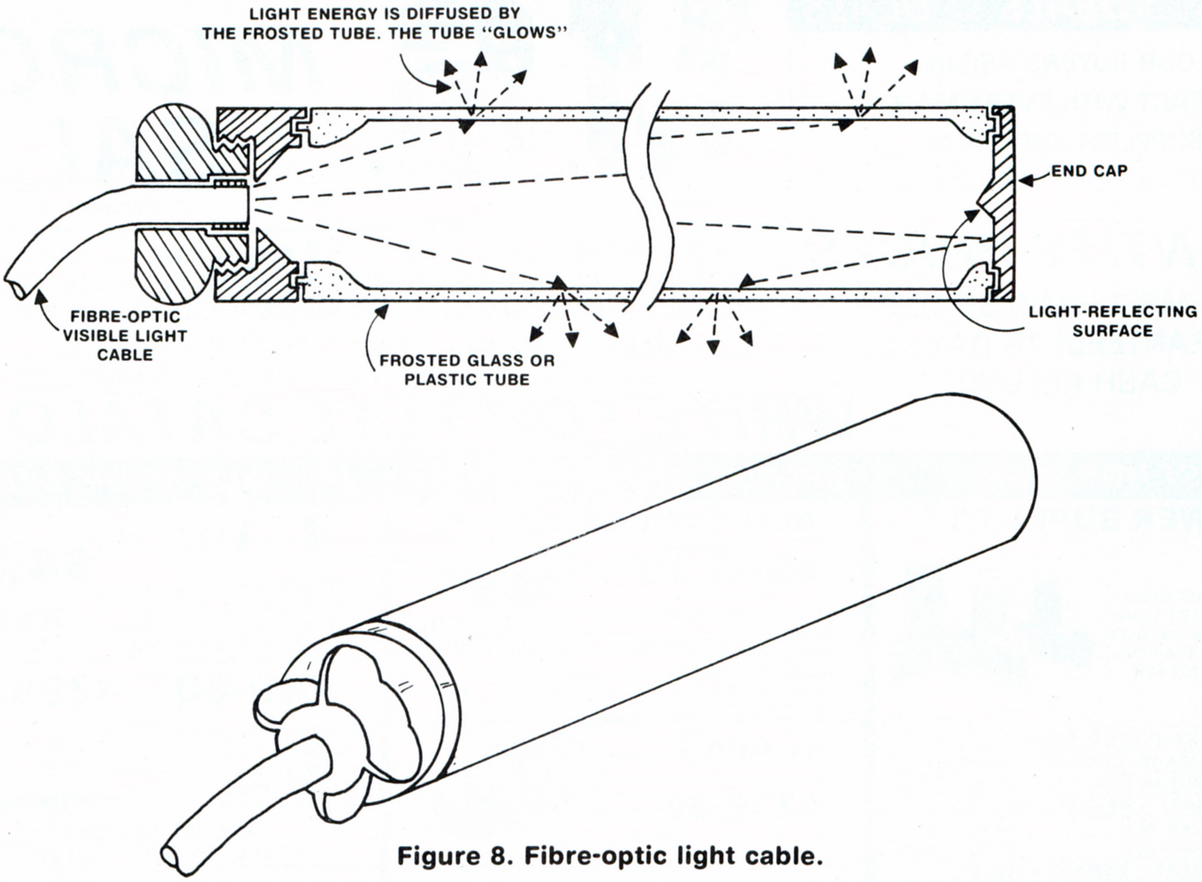

LIGHT ENERGY IS DIFFUSED BY THE FROSTED TUBE. THE TUBE "GLOWS"
END CAP
LIGHT-REFLECTING SURFACE
FIBRE-OPTIC VISIBLE LIGHT CABLE
FROSTED GLASS OR PLASTIC TUBE

Figure 8. Fibre-optic light cable.

washer or tap. There would be no need to maintain a reserve of hot water in a tank somewhere in the basement. The water is heated where and when it is needed.

We will also want to light our homes so we use a unit such as this "light-stick" (figure 8).

Obviously we will need some way of turning the lights and radiators on and off (figure 9). Here is one quite simple mechanical method. Notice that as the right-hand cable is moved down, moving the mirror into place, the energy is reflected back down the "supply" cable. Eventually this energy will be used at some other location in the house, across town, or across the nation, since it stays in the cable "grid" until it is either used somewhere, is absorbed by the cable (released as heat energy) or ends up back in the high-

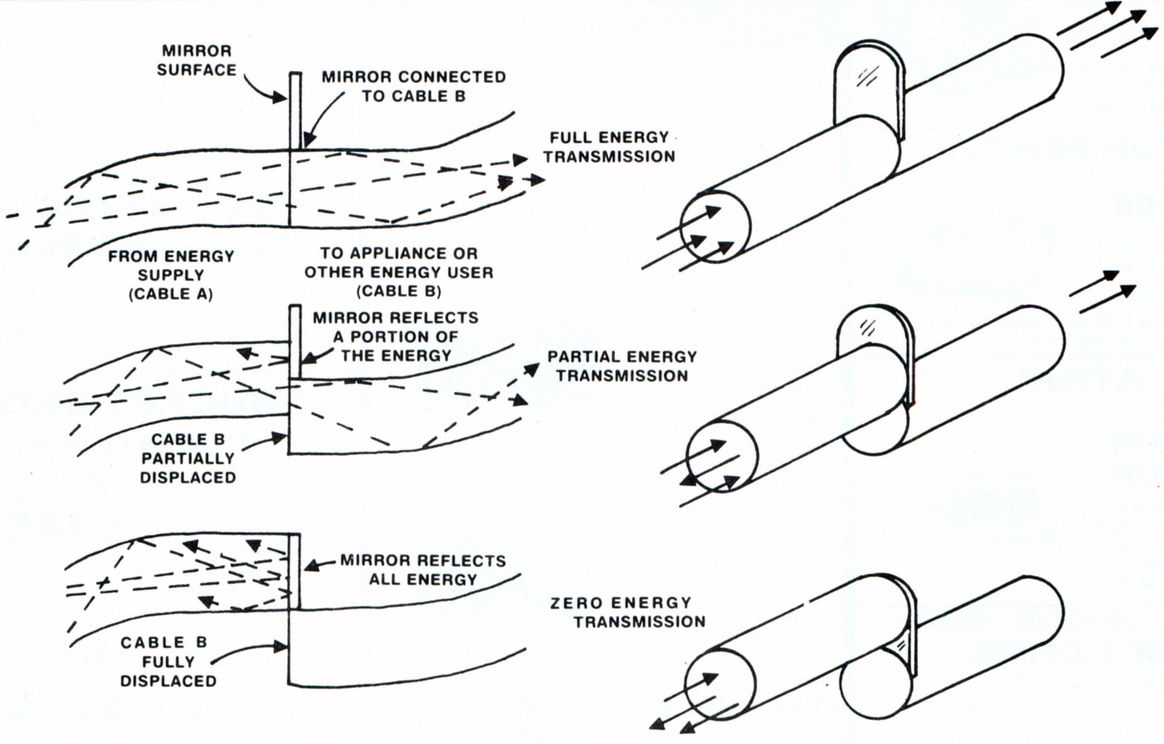

MIRROR SURFACE
MIRROR CONNECTED TO CABLE B
FULL ENERGY TRANSMISSION
FROM ENERGY SUPPLY (CABLE A)
TO APPLIANCE OR OTHER ENERGY USER (CABLE B)
MIRROR REFLECTS A PORTION OF THE ENERGY
PARTIAL ENERGY TRANSMISSION
CABLE B PARTIALLY DISPLACED
MIRROR REFLECTS ALL ENERGY
ZERO ENERGY TRANSMISSION
CABLE B FULLY DISPLACED

Figure 9. Simple mechanical on/off device.

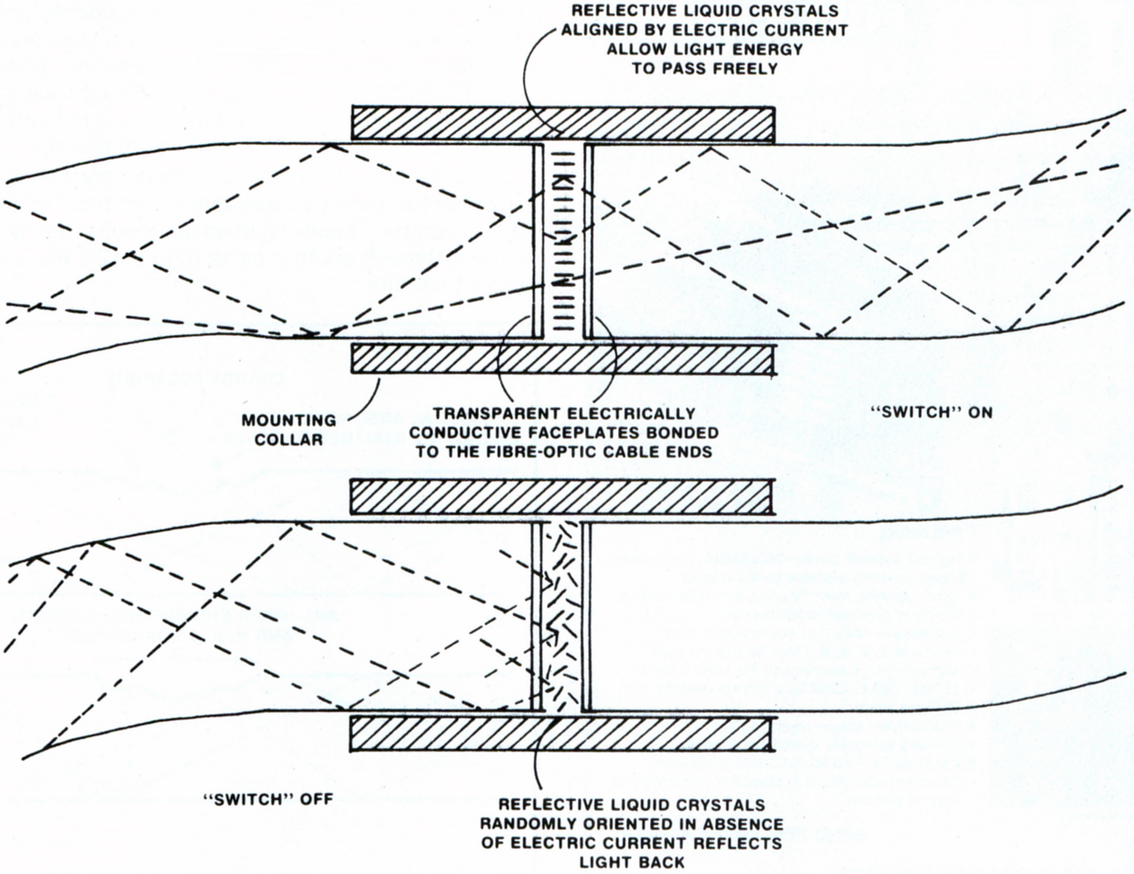

REFLECTIVE LIQUID CRYSTALS ALIGNED BY ELECTRIC CURRENT ALLOW LIGHT ENERGY TO PASS FREELY
MOUNTING COLLAR
TRANSPARENT ELECTRICALLY CONDUCTIVE FACEPLATES BONDED TO THE FIBRE-OPTIC CABLE ENDS
"SWITCH" ON
"SWITCH" OFF
REFLECTIVE LIQUID CRYSTALS RANDOMLY ORIENTED IN ABSENCE OF ELECTRIC CURRENT REFLECTS LIGHT BACK

Figure 10. Liquid crystal energy switch.

power laser which powers the grid. If it does end up back in the laser, it is not lost. Due to the nature of lasers, this energy essentially gets "recycled" by triggering subsequent energy emissions.

Another possible method of controlling the amount of energy used is by reflective liquid crystal switch (figure 10). When an electric current is passed between the two transparent electrodes, the crystals line up and allow light to pass through. When the current is turned off, the crystals become randomly oriented and reflect the light energy just like a mirror. Intermediate current levels will cause corresponding amounts of energy to pass, so this switch can also be used as a valve.

We will certainly need to measure the amount of energy passing through a fibre-optic cable (figure 11), if for nothing more than determining how much energy we are using so that

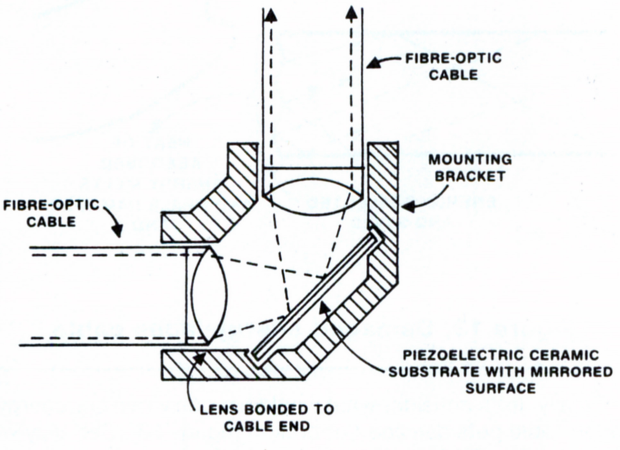

FIBRE-OPTIC CABLE
MOUNTING BRACKET
FIBRE-OPTIC CABLE
PIEZOELECTRIC CERAMIC SUBSTRATE WITH MIRRORED SURFACE
LENS BONDED TO CABLE END

Figure 11. Flow meter measuring energy transmission.

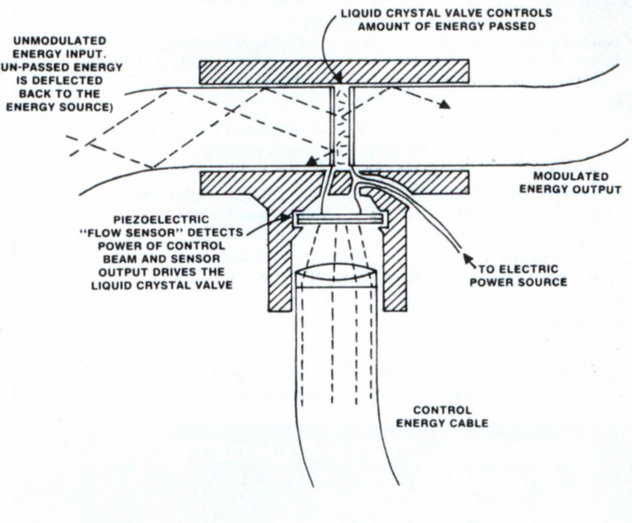
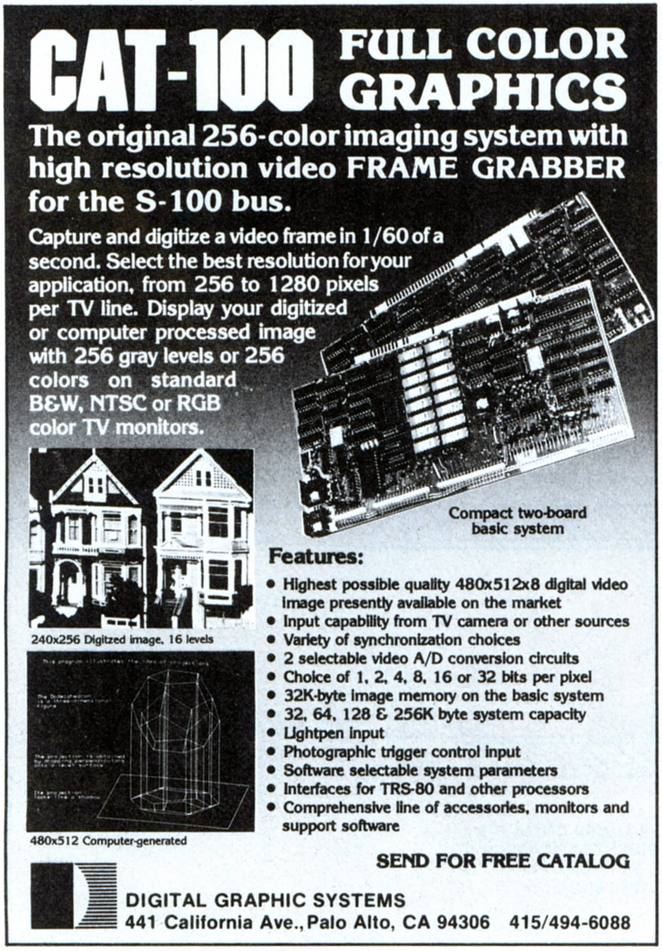

LIQUID CRYSTAL VALVE CONTROLS AMOUNT OF ENERGY PASSED
UNMODULATED ENERGY INPUT. (UN-PASSED ENERGY IS DEFLECTED BACK TO THE ENERGY SOURCE)
MODULATED ENERGY OUTPUT
PIEZOELECTRIC "FLOW SENSOR" DETECTS POWER OF CONTROL BEAM AND SENSOR OUTPUT DRIVES THE LIQUID CRYSTAL VALVE
TO ELECTRIC POWER SOURCE
CONTROL ENERGY CABLE

Figure 12. Energy transistor.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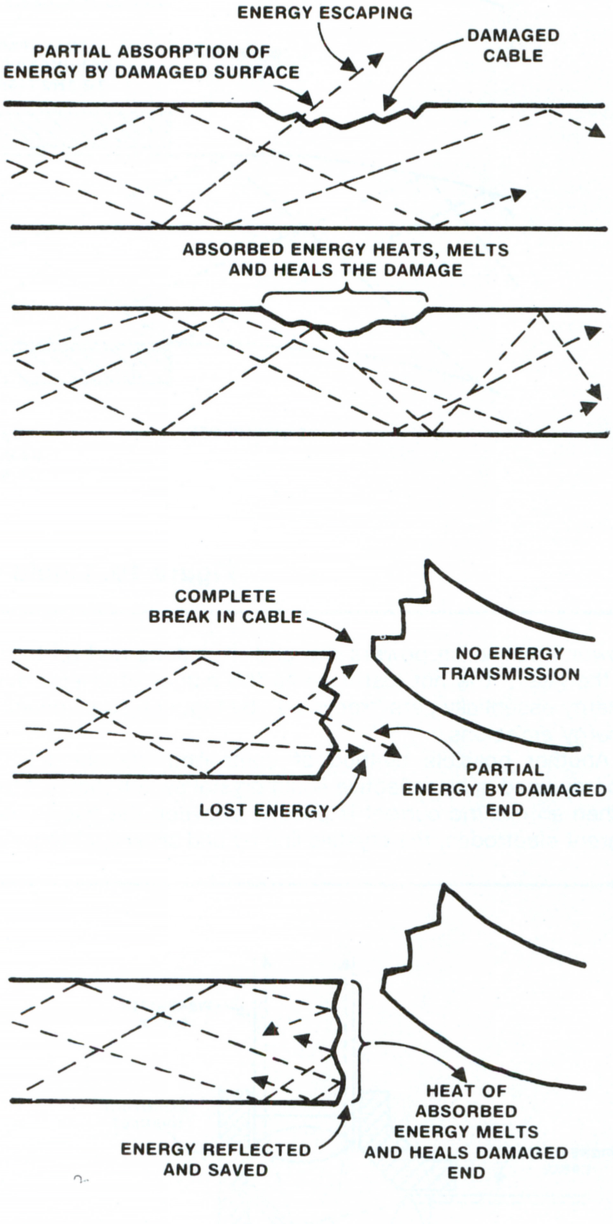
we can pay our bill to the utility company. If we "bounce" the energy off of a mirror-surfaced piezoelectric ceramic substrate (which emits a current when under pressure), we should be able to measure the light beam "pressure" and thereby determine the energy flow. (*Maybe* we can do this. Although the energy flow will be high, it is not certain that the piezoelectric ceramic will be able to detect it.)

Suppose we now combine the liquid crystal valve with the piezoelectric ceramic "flow meter" so that the energy level of a "control" beam is used to modify the energy level passing through another cable (figure 12). We would have a "light transistor."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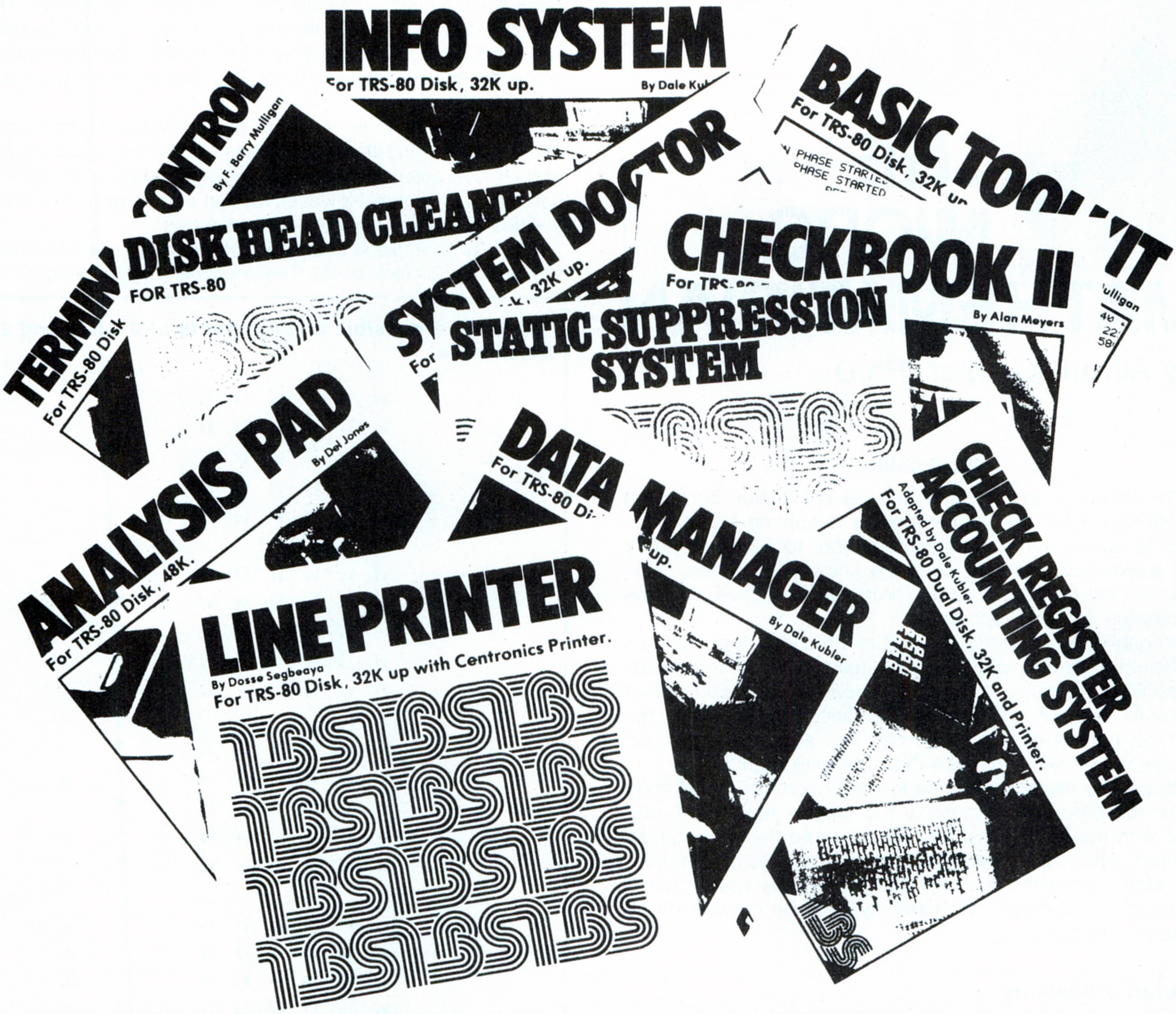
DAMAGED CABLE
ABSORBED ENERGY HEATS, MELTS AND HEALS THE DAMAGE
COMPLETE BREAK IN CABLE
NO ENERGY TRANSMISSION
PARTIAL ENERGY BY DAMAGED END
LOST ENERGY
HEAT OF ABSORBED ENERGY MELTS AND HEALS DAMAGED END
ENERGY REFLECTED AND SAVED

Figure 13. Damaged energy-laden cable.

Finally, let's consider what would happen when our energy-laden cable gets damaged or broken (figure 13). Certainly we do not want all of that energy to simply escape into the air. Might it not be possible to coat the cable with a heat-sensitive material that, when heated by escaping energy, melts and heals the damage? Interesting concepts, yes? Can it be done? Some of it, certainly. Perhaps someone will take up the challenge and develop this new technology. □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THE MICRO-MATHEMATICIAN

by Alfred A. Adler, Ph.D.

Probability

The theory of probability has wide application in modern technology, from the engineering of telephone traffic problems to quality control in manufacturing, to quantum theory and wave mechanics. Since some knowledge of this discipline should be part of every programmer's arsenal, some discussion appears appropriate.

Probability is not difficult; what is difficult is formulating a sufficiently precise question and following it with precise reasoning. The subject requires a degree of exactitude not found in other branches of mathematics, and to which the average person is most assuredly not attuned. A few examples will serve to indicate the reasoning required.

Probability theory cannot be learned overnight. Most texts cover the introductory material too rapidly, leaving the student with the feeling that he has mastered the basic fundamentals, whereas a small change in the form of a simple problem might leave him lost. In this article, the reader won't cover lots of ground: but hopefully what he covers will be readily understood.

A priori probability

This represents a statement of probabilities before any trials. This is in opposition to statistical or a posteriori probability, which will be discussed later.

Suppose I flip two pennies. In how many possible ways can these coins fall? Many will say three: two heads, two tails, or a head and a tail. Unfortunately, that is not correct. Actually there are four. Penny A can come up a head or a tail, and penny B can come up a head or a tail. Therefore we can have two heads, a head and a tail, a tail and a head, or two tails.

The probability of a particular outcome is the number of ways that outcome can occur divided by the total number of ways all outcomes can occur. A head and a tail can occur in two (not one but two) possible ways out of a total of four possible events (not three). Therefore the probability of the coins showing dissimilar faces is .5. The probability of two heads is .25, and that of two tails is .25. Note that the sum of the probabilities of all possible outcomes equals 1, as of course it always must, since the probability of any other event occurring is zero.

As an introduction, let us consider some of the basic principles of combinatorial analysis.

Suppose event A can happen in m ways and event B can happen in n ways. Then A followed by B can happen in mn ways. Note that this tells us nothing about B followed by A. That is a completely different problem.

If the happening of A excludes the happening of B, and the happening of B excludes the happening of A, events A and B are said to be mutually exclusive. If two mutually exclusive events, A and B, can happen in m and n ways respectively, then either A or B can happen in m + n ways.

To illustrate, consider a box containing 5 white balls and 8 black balls. A number of balls will be drawn in succession. The first ball can be drawn in any one of 13 ways; a white ball in 5 ways and a black ball in 8 ways. The probability of drawing a white ball the first time is 5/13, and that of drawing a black ball is 8/13.

On the second draw there are only 12 ways in which a ball can be drawn, and the probabilities of drawing a second ball of a chosen color cannot be stated until the color of the first ball drawn is known. However we can state a priori the probabilities of making any given set of draws.

What for example is the probability of drawing 4 white balls followed by 2 black balls? The probability of drawing a first white ball is 5/13. If this succeeds, there are only 4 white balls left and the probability of drawing a second white ball is therefore 4/12.

Table 1. 15 possible arrangements of 4 white and 2 black balls.

A	W	W	W	W	B	B		
B	W	W	W	B	W	B		
C	W	W	B	W	W	B		
D	W	B	W	W	W	B		
E	B	W	W	W	W	B		
A	W	W	W	W	B	B	*	
	W	W	W	B	B	W	*	
	W	W	B	W	B	W	*	
	W	B	W	W	B	W	*	
	B	W	W	W	B	W	*	
B	W	W	W	B	W	B	*	
	W	W	W	B	B	W		X
	W	W	B	B	W	W	*	
	W	B	W	B	W	W	*	
	B	W	W	B	W	W	*	
C	W	W	B	W	W	B	*	
	W	W	B	W	B	W		X
	W	W	B	B	W	W		X
	W	B	B	W	W	W	*	
	B	W	B	W	W	W	*	
D	W	B	W	W	W	B	*	
	W	B	W	W	B	W		X
	W	B	W	B	W	W		X
	W	B	B	W	W	W		X
	B	B	W	W	W	W	*	
E	B	W	W	W	W	B	*	
	B	W	W	W	B	W		X
	B	W	W	B	W	W		X
	B	W	B	W	W	W		X
	B	B	W	W	W	W		X

The probability of drawing a third and fourth white ball is 3/11 and 2/10, respectively. By multiplying these 6 results together (since each is dependent on the success of all those that went before), we arrive at the final answer. Another approach is to examine the number of ways in which each event could occur and divide by the total number of events that could occur. This would lead to the following line of reasoning.

The first white ball could be drawn in 5 ways, the second in 4, and the third and fourth in 3 and 2 respectively. The black

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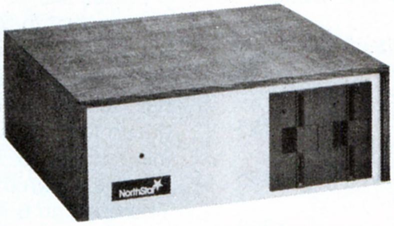

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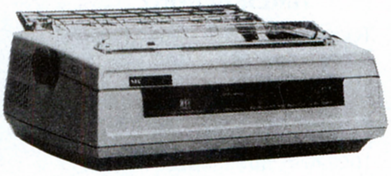

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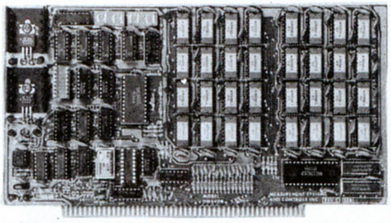

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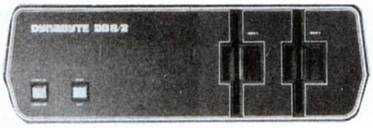

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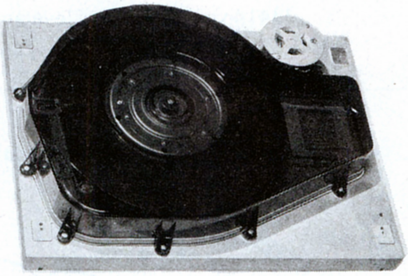

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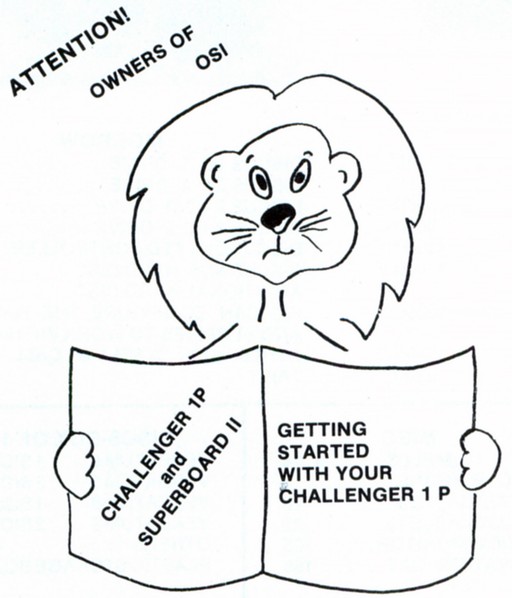

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balls could be drawn in 8 and 7 ways respectively. The total number of events that could have occurred can be computed as follows. At the first draw, 13 possible events could have occurred, and so on down to 8 different events on the sixth and last draw.

Thus the total number of possible events that could lead to a successful drawing of 4 white balls followed by 2 black balls would be 5 × 4 × 3 × 2 × 8 × 7 = 6720. The total number of possible events in 6 successive draws is 13 × 12 × 11 × 4 × 9 × 8 = 1235520. The probability of drawing the 6 consecutive balls as required is therefore 6720/1235520 or .005439. This, of course, is the same answer obtained by the previous line of reasoning.

Note that in the previous example it was assumed that the balls were not replaced after each draw. If that had been done, the results would have been very different. Each white ball could be drawn in 5 ways and each black ball could be drawn in 8 ways, thus the required series of draws could be made in 5 × 5 × 5 × 5 × 8 × 8 = 40000 ways. Each time a ball is drawn there are 13 possible events that could occur. Therefore in 6 draws 13 × 13 × 13 × 13 × 13 × 13 = 4826809 events could occur.

Success probability 1½ times greater

The probability of successfully completing the series is therefore 40000/4826809 = .008287 or about 1.5 times as great as if the balls had not been replaced after each draw. Note that this same probability applies to drawing 4 white balls and 2 black balls in a prespecified order. If the order is not prespecified, and therefore any order is acceptable, the probability of satisfying the requirements is much greater.

When we took the position above that the first white ball could be drawn in 5 different ways, we essentially said that each ball had a letter stamped on it, and the first white ball drawn could be white ball A, or white ball B, and so on. We also took this same position when we calculated the total number of ways in which any 6 balls could be drawn consecutively. The number of ways in which things can occur, using this type of reasoning, is called a permutation.

If we had required only 4 white balls and 2 black balls be drawn, but not necessarily in any special order, we would be computing the number of combinations, and of course, the results would be quite different. Combinations will be discussed and compared to permutations in a later section.

The probability of success if the order were unimportant would clearly be greater than if only one of the many possible orders is satisfactory. This illustrates the previous observation regarding the degree of definiteness and completeness required in the statement of the problem if there is to be any hope of obtaining a correct answer.

Perhaps we can formalize these calculations into a general equation. In the case where the balls are not replaced, we note that as long as balls of the same color are being drawn, the number of ways they can be drawn, successfully or otherwise, decreases by one as each draw is made.

Thus the first draw can be made successfully in 5 ways but can be made in a total of 13 ways. The first 4 draws can be successfully made in 5 × 4 × 3 × 2 ways. This can be formalized as follows. Letting n be the total number of white balls in the box and r be the number of consecutive white balls required to be drawn, the number of ways that these conditions can successfully be met is

$$P(n,r) = \frac{n!}{(n - r)!}$$

where P(n,r) is the number of permutations of n things taken r at a time.

Thus 4 white balls can be drawn from the box in 5!/(5 − 4)! = 120/1 or 120 ways. The number of ways that 2 black balls can be drawn is 8!/(8 − 2)! or 56 ways. The number of ways that both of these events can occur successively is therefore

$120 \times 56 = 6720$ ways. The total number of ways that any 6 balls could have been drawn is $13!/(13-6)! = 1235520$ ways. The probability of success is therefore 6720/1235520. These are the same numbers we obtained before.

In the above example it was stated that 4 white balls could be drawn consecutively from a box containing 5 white balls and 8 black balls in 120 different ways. It should be noted that the contents of the box, other than 5 white balls, is totally irrelevant. Further, in considering the black balls, it was stated that 2 black balls could be drawn consecutively from a box containing 1 white ball and 8 black balls in 56 different ways. Again, the contents of the box, other than the 8 black balls, does not affect the results in any way.

We can change the problem slightly so that we no longer care about the order in which the balls are drawn, as long as we end up with 4 whites and 2 blacks. Note that this is now the same as if we had specified that 6 balls were to be drawn simultaneously. In this case the problem would be one of computing the number of combinations, as opposed to permutations. If we have n white balls and want to select r of them, without regard to the order in which they are chosen, we can do this in C(n,r) ways, where C(n,r) is the number of combinations of n things taken r at a time.

After we have chosen the r white balls in any one of C(n,r) different ways, we can arrange these particular balls in r! different ways. If we do this for all of the C(n,r) different ways, we will have all the permutations of n things taken r at a time. Thus

$$C(n,r)\, r! = P(n,r)$$

or

$$C(n,r) = \frac{n!}{r!\,(n-r)!}$$

If we attempt to choose 4 white balls simultaneously from the box, we find that this can be done in $5!/4!(5-4)! = 5$ different ways. If we then attempt to draw 2 black balls simultaneously, we see that this can be done in $8!/2!(8-2)! = 28$ different ways. Thus both events can occur in $5 \times 28 = 140$ different ways. The total number of ways that any 4 balls followed by any 2 balls could be chosen is $13!/4!\,(13-4)! = 715$ ways times $9!/2!\,(9-2)! = 36$ ways or 25740 different ways.

Since there are 25740 ways the balls can be chosen, of which only 140 give us the desired result (4 white balls followed by 2 black balls), the probability of success is .005439. This is the same result we obtained before; we simply did the calculations using combinations rather than permutations. We could do this because we cared only about the order insofar as we wanted white balls before black balls; we did not care about the order of the whites or the order of the blacks.

Revised calculation procedure

Now let us proceed to the problem of drawing 4 white balls and 2 black balls in any order. Let us first do the calculation formally and then attempt to verify the answer by listing all the possibilities. Formally, we can draw 4 white balls from among 5 in C(5,4) ways and we can draw 2 black balls from among 8 in C(8,2) ways. We can do both in C(5,4)C(8,2) ways.

This calculation has been done before; the result is $5 \times 28 = 140$ different ways. We can draw 6 balls from among 13 in $C(13,6) = 1716$ ways. The probability of drawing 4 white and 2 black balls without regard to order is therefore $140/1716 = .081585$ or 15 times as great as if we specify that the 4 white balls must be the first chosen.

This can be verified experimentally by reasoning as follows. Whereas before the only acceptable arrangement of the 6 balls was WWWWBB, we will not accept any order. If these 6 balls can be arranged in 15 and only 15 different orders, our formally calculated value is verified. Therefore let us start with WWWWBB and systematically rearrange the balls and see what happens.

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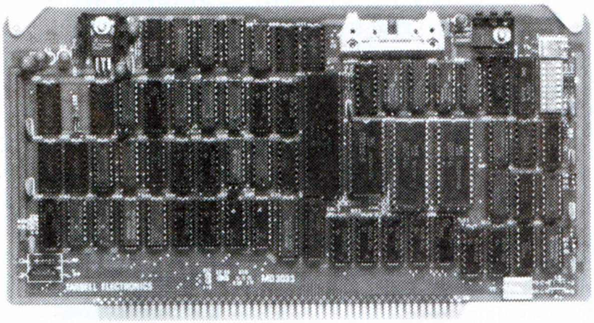

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At first it would appear that one of the black balls can be moved from say the 6th position to the 1st, 2nd, 3rd, etc., thus giving 6 different arrangements. Each of these can then be varied by moving the other black ball to each of 6 different positions, thus obtaining 36 different arrangements. That this is incorrect is obvious when one realizes that placing the 6th ball (black) in position 5 (also black), for example, changes nothing and therefore there can be no more than 5 × 5 = 25 different arrangements, not 36.

If we examine the proposed 25 arrangements, we find considerable duplication (table 1). The original arrangement WWWWBB is varied first by moving the 5th position black ball to the 4th, 3rd, 2nd, and 1st positions. These arrangements are successively labeled A through E. Each of the A through E arrangements is then varied by letting the 6th position black ball move into the other 4 possible positions. This results in 25 possible arrangements, but when the duplicates, marked with an X, are eliminated, there are only 15 unique arrangements, marked with an *, left.

Statistical probability

In many cases it is, in principle, impossible to determine the number of ways in which a desired event can occur as a fraction of the number of ways in which all events can occur. For example, the probability of failure of a transistor within the first hour of operation cannot be computed a priori.

It must be determined a posteriori, which often means conducting repeated trials or inspecting a statistically significant sample. If failure occurs m times in n trials, the relative frequency of failure can be said to be m/n. If m/n is assumed to approach a limit as n approaches infinity, this limit is defined as the probability of failure.

In order to draw conclusions as to a posteriori probabilities, we must have a body of information on which to base our figures. This data is usually organized into a probability distribution function, and a probability density function, the latter being derived from the former. The following discussion will introduce these concepts.

Suppose we measure the height of everyone over the age of 18 in the United States and attempt to determine, from the data, the probability that an arbitrary chosen person is exactly 5 feet tall. Well, exactly 5 feet tall means 5.0000000000000 etc. feet tall. The probability of finding a person exactly that tall is virtually zero. But obviously there are many people very, very close to 5 feet tall. We have asked the wrong question. This is an ever present danger as was mentioned before.

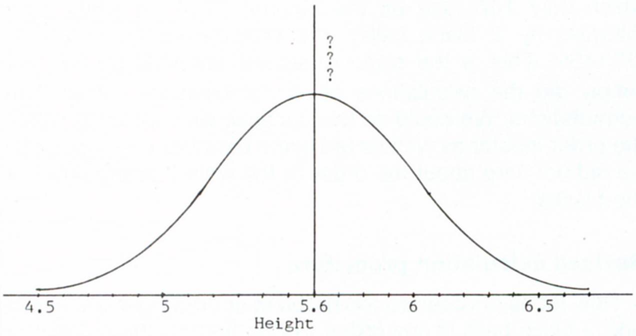

Figure 1. Attempt to plot number of people vs height.

Let us ask instead, what is the probability that an arbitrarily chosen person is between 4.999 and 5.001 feet tall? This is an easy question. If there are, say, 200 million people in the population over 18 years old, and of these, say, ¼ million are between 4.999 and 5.001 feet tall, then the probability that the height of an arbitrarily chosen person is between these two figures is .25/200 = .00125.

But suppose we had chosen a height interval of 4.998 to 5.002 feet tall? There would likely be about ½ million people

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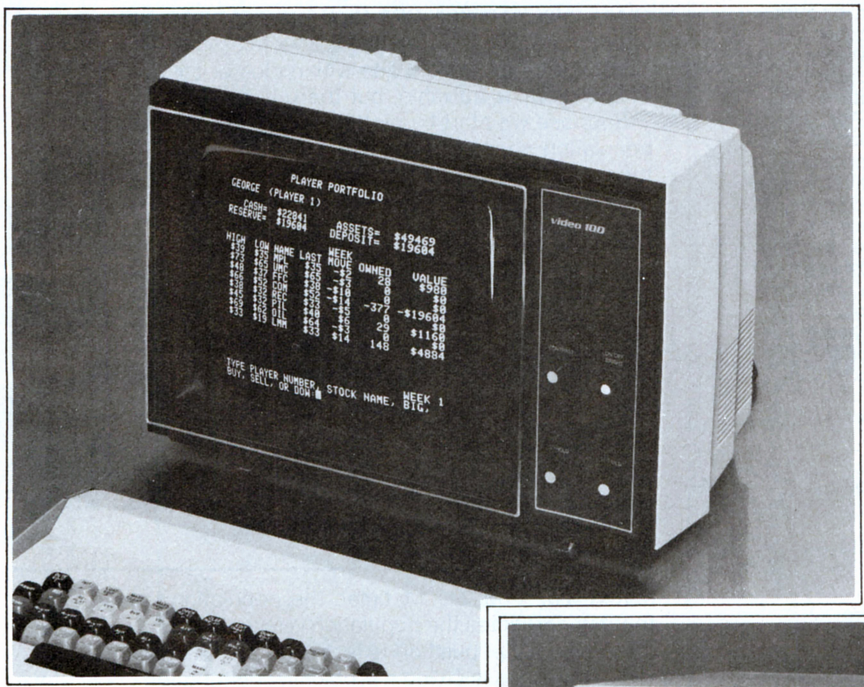

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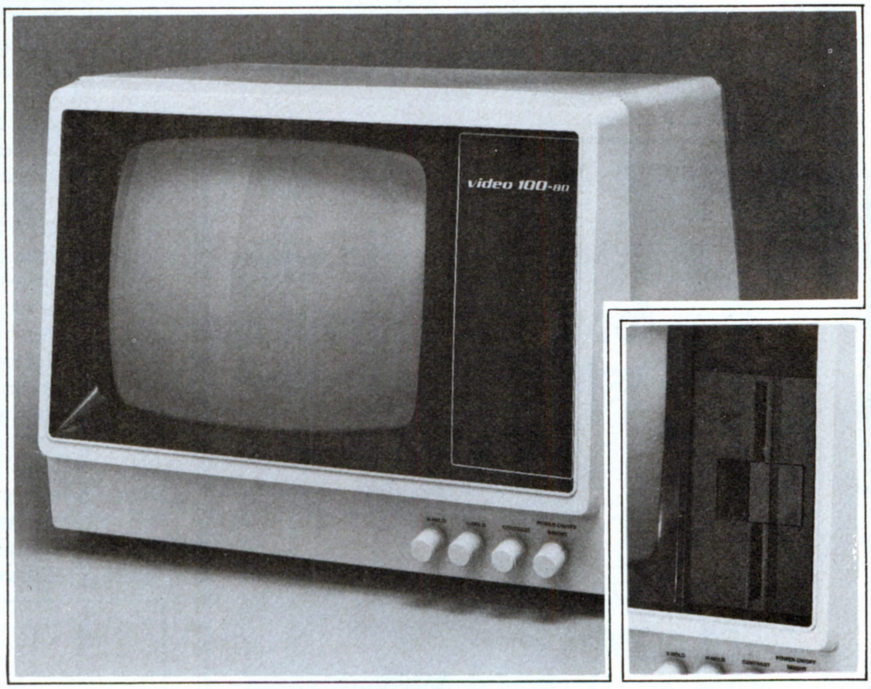

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within that height interval, and therefore the probability of finding someone between those limits would be about .5/200 = .0025. Therefore, we see that the probability of finding someone within the limits depends on the limits themselves; that is, the width of the interval within which the prescribed conditions are satisfied.

If we attempt to plot a curve of these probabilities versus height, we run into obvious difficulties. If we choose a fixed interval applicable to all heights, such as the first one we chose (plus or minus .001 foot), we can plot a curve such as figure 1. But what do we call the vertical scale? We could try "probability that height lies within plus or minus .001 foot." The problem is solvable, but there is an easier way.

Suppose we start by plotting a curve of the fraction of the population whose heights lie *below* any chosen height, versus the chosen height. It will look like figure 2, which, for example states that 11% or .11 times the population is less than 5 feet tall, .50 times the population is less than 5.6 feet tall, and .88 times the population is less than 6.2 feet tall.

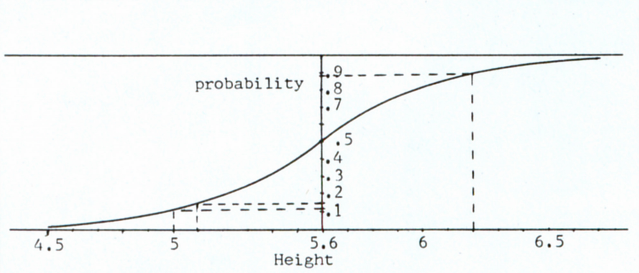

Figure 2. Curve of a fraction of population whose height is below any chosen height.

Such a curve is called a probability distribution curve. If we now determine the slope of this curve for each value of height, and plot this slope versus height, we will get the curve of figure 1, but with one important additional feature. The area under this new curve will be exactly 1.

This can be interpreted as follows. The vertical value of the curve in figure 2 is the probability that an individual height will be less than the chosen value. The slope of this curve represents the rate at which this probability is changing divided by the rate at which the chosen height is changing. For instance, let us measure the slope between 5 feet and 5.1 feet. At 5 feet, the vertical value equals .11 and at 5.1 feet it is .142.

Thus the slope is (.142 – .11)/(5.1 – 5) = .32. Now note that from the above figures, .142 of the population is less than 5.1 feet tall and .11 of the population is less than 5 feet tall. It follows therefore that .032 of the population is between 5 feet and 5.1 feet tall. But if we go back and multiply the slope of the curve in figure 2 by the interval between the height limits we have chosen, we get this same answer. In figure 3 we have plotted the slope of the curve in figure 2 versus height. Note that multiplying a slope by an interval of height gives us an area. Therefore, the area under the curve between any two height limits gives the probability that an individual height will lie between those values. Since the total area under the curve represents all possible circumstances,

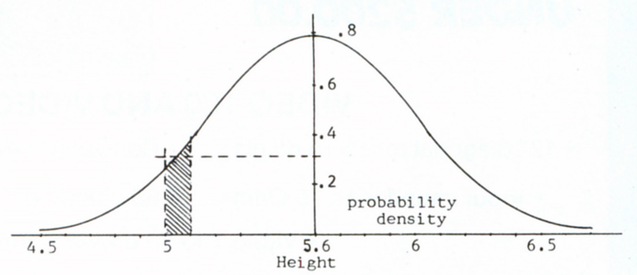

Figure 3. Slope of curve of figure 2 vs height.

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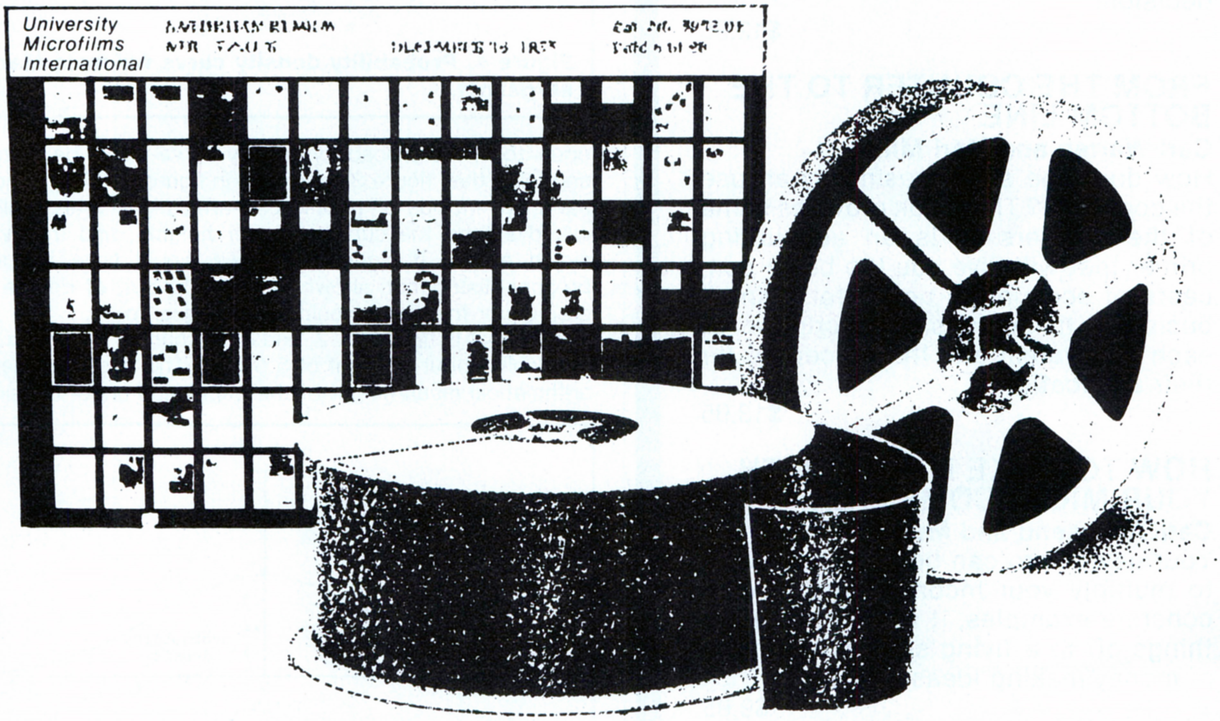
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the total area under the curve must equal 1. Such a curve is called a probability density curve.

The actual determination of these curves is done using methods of calculus, which permit the slope to be determined exactly at each value of height, thus eliminating the averaging technique over a height interval that we have been forced to use.

If, instead of considering the heights of all people over the age of 18 in the U.S., we restrict our population to male sergeants in the Marine Corps, we find that the height range into which the great majority fell would be much narrower. Since, however, the total area under the curve must remain equal to 1, the probability density curve would be narrower and taller than figure 3, as shown in figure 4. If, on the other hand, we include all people on earth, pigmies and children would extend the curve to lower heights, and the Watusi would extend it higher. Thus we would have the lower broader distribution shown in figure 5; but, of course, the area under the curve would still be equal to 1.

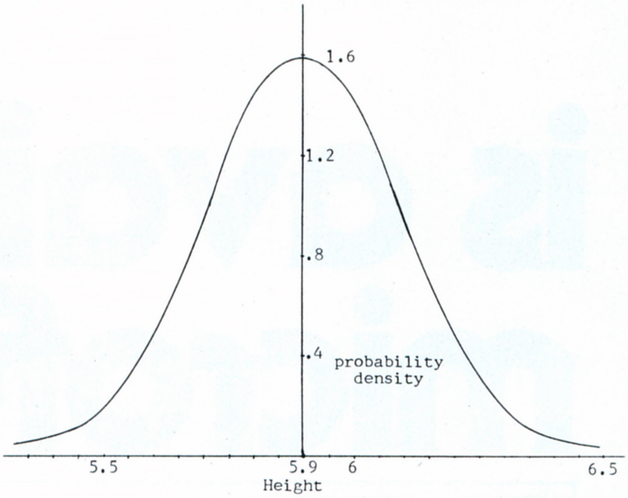


Figure 4. Probability density curve for male Marine sergeants.

Note that in figures 1, 2, and 3, the curves are drawn symmetrically about a height of 5.6 feet. This assumes that the arithmetical mean height of the population under consideration is 5.6 feet. In figure 4, the curve is symmetric about 5.9 feet since that is assumed to be the mean height of male Marine sergeants, whereas the axis of symmetry is at 5 feet in figure 5 since it is assumed that all the people of the earth average 5 feet in height.

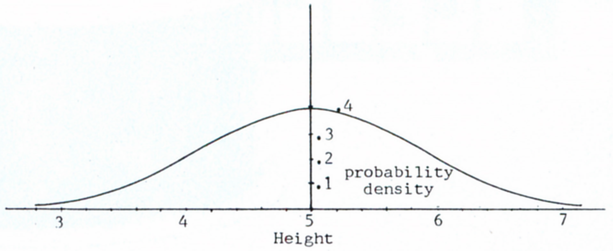
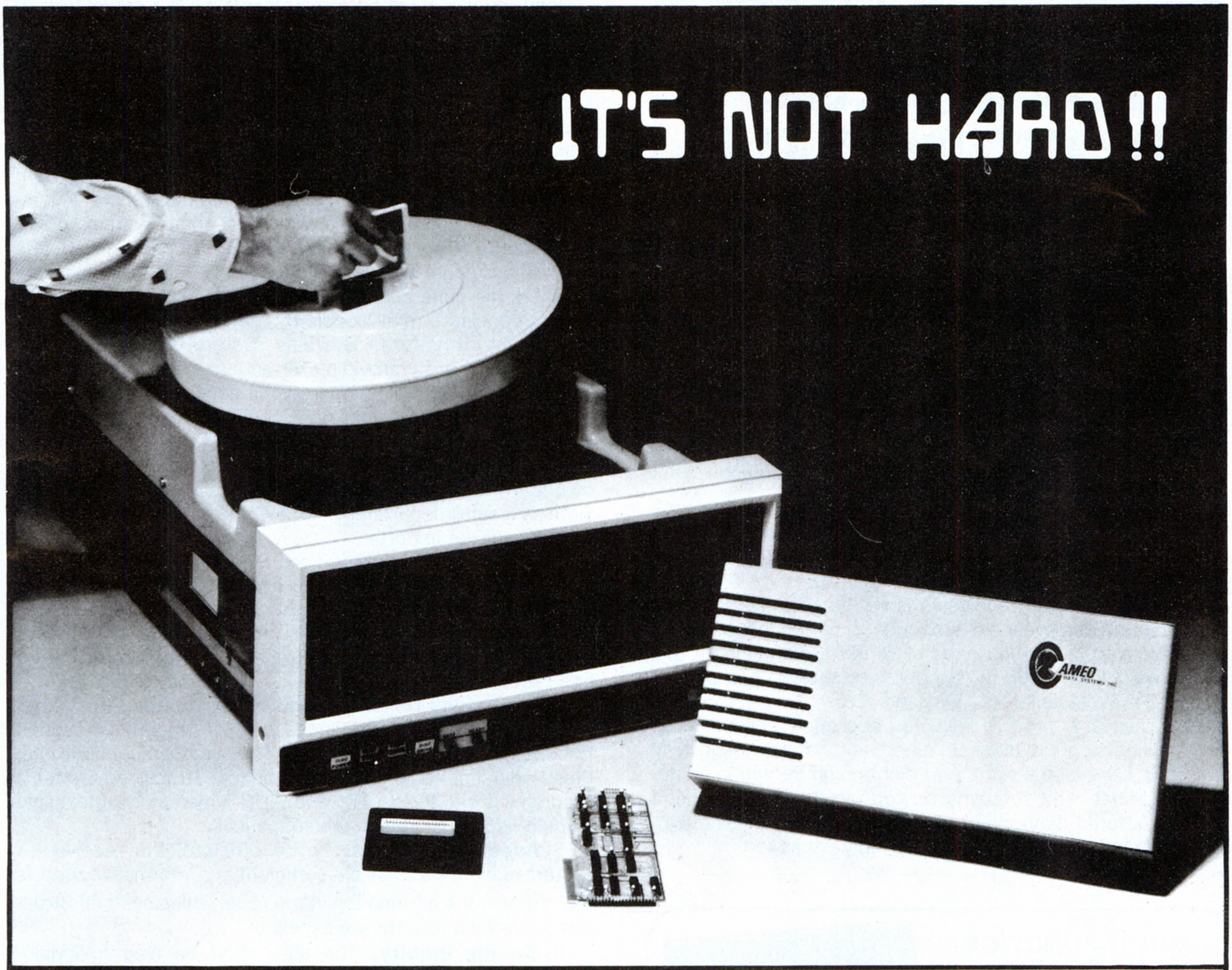


Figure 5. Probability density for total population.

Note that only two parameters are necessary to completely describe a probability density curve. One is the mean value of the variable (in this case height) about which the curve is symmetric. The other is required to differentiate a tall narrow curve from a low broad curve. This parameter is called the standard deviation and tells us something about the range of the variable within which a certain fraction of the total population will fall. ☐



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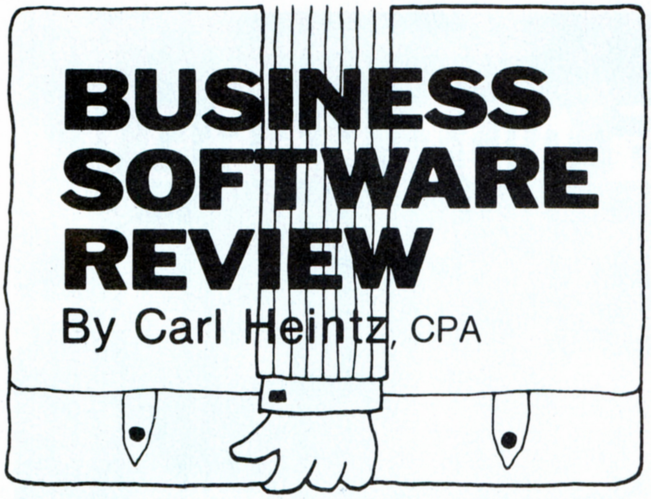

BUSINESS SOFTWARE REVIEW

By Carl Heintz, CPA

A Flexible Accounts Receivable Package

One of the most important application packages a business can purchase—accounts receivable—is one of the most cost-justified for a microcomputer, in many cases paying for itself in a year or less.

Managing accounts receivable is not simple. A useful program must be comprehensive enough to do the job, and flexible enough to meet the needs of varied businesses. In this article, we will focus on the accounts receivable package by Structured Systems Group, Oakland, CA.

What makes a good receivables package? The same as what makes a good meal: it must be complete, carefully prepared, have all the right ingredients, and served in an appealing format. And shouldn't be too big a bite for the end user. Structured Systems receivables software has all the ingredients, in the proper mix, appealingly packaged.

Some of the common requirements of the computerized receivables package include:

(1) **Open item processing.** The package keeps track of individual invoices that are unpaid. Some simple receivables packages simply lump all unpaid invoices at the end of a billing cycle into a "balance forward" that appears as a single number on the next statement. Structured Systems has the open item system, and implements it with an important feature that allows the user to apply receipts to particular invoices instead of just to the oldest (as some systems do).

(2) **Accounting system interface.** The package creates summaries of general ledger accounts affected so that entries into the general ledger can be made. This output should be in a concise format, usable by the average bean-counting accountant. Structured Systems system has it—and goes one step further by providing for an automatic update of the general ledger so that numbers don't have to be key-punched twice. Of course, this is only compatible with Structured Systems G/L package. The system allows for accounting by product line, so that the accounting output can include sales by departments or product types. This is critical in a business such as a small department store where profits by line and/or department are important.

(3) **Ease of data entry.** Time is money, especially when mounds of invoices have to be entered and the end of the month is only hours away. Nothing can be more frustrating than a program that does not facilitate rapid data entry. Errors multiply, operators get frustrated, and the computer gets a bad reputation.

(4) **Provisions for credit and debit memos.** Most small businesses have many instances in which amounts are added to or deleted from customer bills. The system must cope with these adjustments in a rational manner. Structured Systems programs treat the "CR" and "DR" memos in the same fashion as an accountant would manually.

(5) **Adequate reports.** To be efficient, the receivables system must make available sufficient and informative reports that analyze the information in the receivables system. Structured Systems reports are excellent.

(6) **On-line inquiry.** The user must be able to inquire about the status of an account without going through a lot of bother. This is important in collection activities where the debtor may be on the phone. The Structured Systems programs are reasonably good in this area.

(7) **Billing cycles.** People with department store or bank credit receive their statements on days other than the end of the month. To reduce the workload in the accounting department, the company splits its billing cycles. For example, A-H may be billed on the 15th, the remainder billed at end of month. The Structured Systems package handles up to 26 cycles. Of course, having cycles also increases the number of accounts that can be accommodated—up to 999 per cycle. Thus the theoretical maximum number of accounts is 25,964 —more than enough for most users.

Pertinent details:

- It runs on any Z-80/8080 micro with at least 48K RAM under CP/M
- Two floppy disks with a capacity of at least 240K per drive
- A 132-column printer that recognizes the Ascii form feed character by skipping to the next form
- Console device with at least 80-column capacity

The programs are written in CBasic (Structured Systems has it for sale). CBasic, for those not familiar with it, is a compiled language—which means that the programs are in a machine-readable-only format. Forget making customized changes. If this is desired, source documentation is available at extra charge.

In contrast, the receivables programs written by Peachtree and others are in an interpreter language, which means that the source is present and can be modified. Many authors in the field of business software stress the importance of ob-

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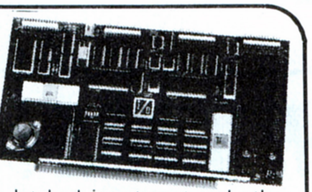

Has two serial Sync/Async ports (RS-232, current loop or TTL) with individual Xtal controlled programmable baudrate generators. Four 8-bit Parallel ports; one latched input port and other three can be programmed in combinations of input, output or bidirectional. Also, has three 16-bit Programmable Timers and an 8-level Programmable Interrupt Controller w/Auto restart (8080 / Z80). Other features include; on-board clock divisor for timers, completely socketed, wire wrap posts for easy port configuration plus more.

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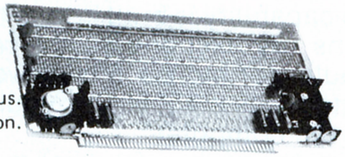

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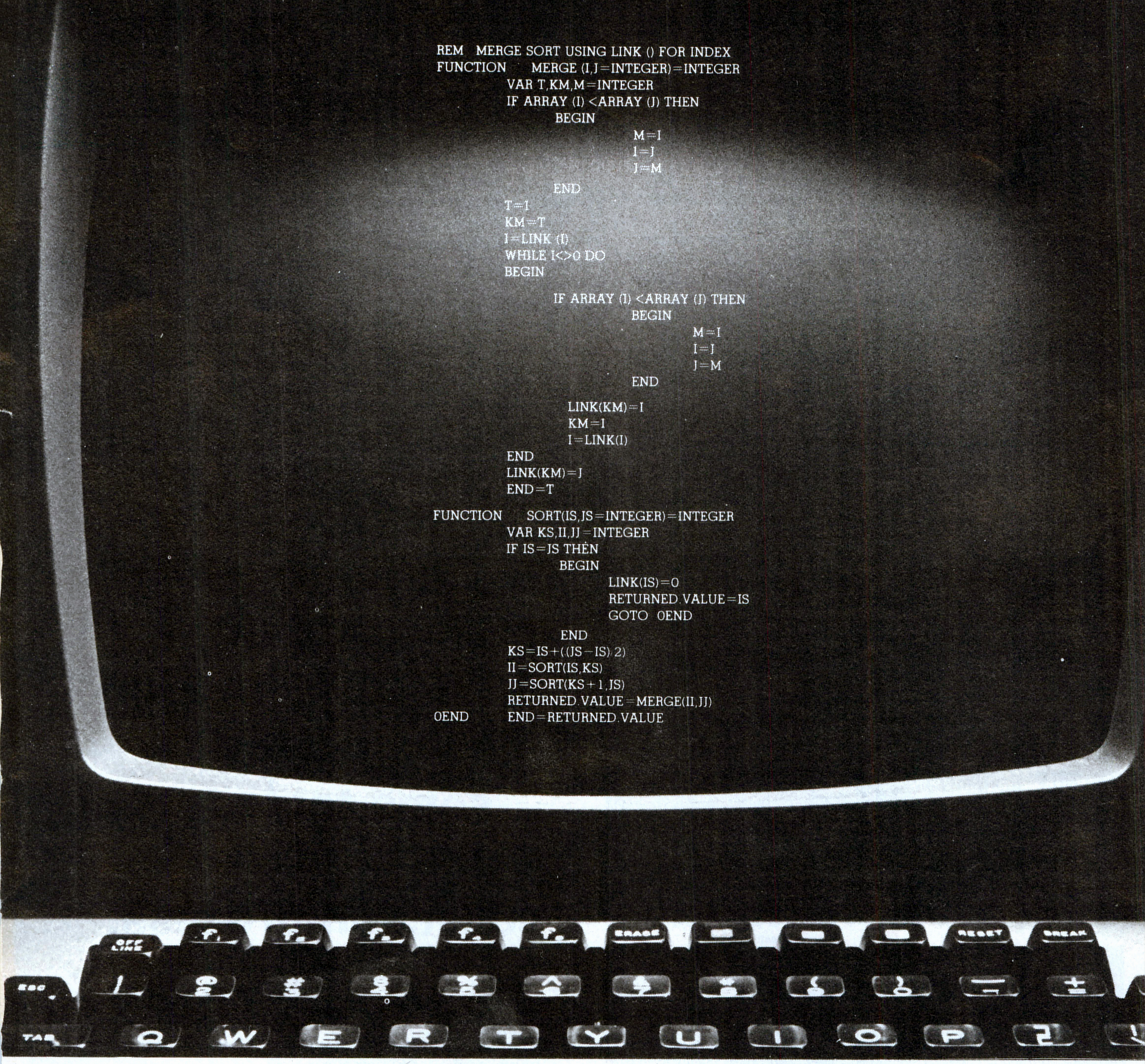

```
REM   MERGE SORT USING LINK () FOR INDEX
FUNCTION     MERGE (I,J=INTEGER)=INTEGER
          VAR T,KM,M=INTEGER
          IF ARRAY (I) <ARRAY (J) THEN
                 BEGIN
                            M=I
                            I=J
                            J=M
                 END
          T=I
          KM=T
          I=LINK (I)
          WHILE I<>0 DO
          BEGIN
                 IF ARRAY (I) <ARRAY (J) THEN
                            BEGIN
                                    M=I
                                    I=J
                                    J=M
                            END
                   LINK(KM)=I
                   KM=I
                   I=LINK(I)
          END
          LINK(KM)=J
          END=T
FUNCTION     SORT(IS,JS=INTEGER)=INTEGER
          VAR KS,II,JJ=INTEGER
          IF IS=JS THEN
                 BEGIN
                        LINK(IS)=0
                        RETURNED.VALUE=IS
                        GOTO  0END
                 END
          KS=IS+((JS-IS)/2)
          II=SORT(IS,KS)
          JJ=SORT(KS+1,JS)
          RETURNED.VALUE=MERGE(II,JJ)
0END      END=RETURNED.VALUE
```

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taining the source code. If the programs are purchased from a reputable source, there is really no need for the source. In most cases, major modifications are so expensive that it is cheaper in the long run to write a custom program.

To be really useful, an accounts receivable program should provide some tools for the credit and collection process. Structured Systems offers some very good reports, a credit limit feature, and a series of collections tools.

The reports that the system generates include the standard list of customers (organized by alpha, customer number or zip), an aged trial balance (30, 60, 90 days), a sales report that shows the sales by lines or departments, and dunning letters. This last feature is somewhat unique. It allows the operator to select old accounts and automatically generate collection letters. SSG has written three sample letters included in the program (the user can use his own if he desires).

The credit limit feature flags any account in which the balance exceeds a preauthorized limit. This allows the credit manager to quickly scan a trial balance and determine which customers are in trouble.

In these days of double digit interest rates, collection fees and late charges are important tools for the collection of outstanding receivables. The SSG system allows for automatic imposition of finance charges, either in a flat amount or a percentage (in the form of interest). The late charges are imposed upon overdue amounts only.

To be really useful, an accounts receivable program should provide some tools for the credit and collection process.

Most accounts receivable programs utilize specialized forms. The SSG programs are no exception, except that the user has the option of whether the company name will be printed or not (so stationary-type forms can be used). The manual helps in reprogramming the forms print function so that nonstandard forms can be used.

If there is any drawback to the SSG system, it is in disk space utilization. The system can run out on a small system if a large number of customers and many transactions are recorded. In such a situation, data may be lost if the user has not backed up his diskettes. It should be stressed that this is not the result of ineffective programming, but the limitations of the hardware systems themselves.

Overall, the SSG receivables system is excellent for the money. It has power and sophistication and, in the hands of a conscientious user, results in a more effective function. However, with complexity of programs comes the higher cost of operator training. These programs are not the kind that an untrained operator can run unassisted the first time. The manual is complete, understandable but intended to be read *before* implementation.☐

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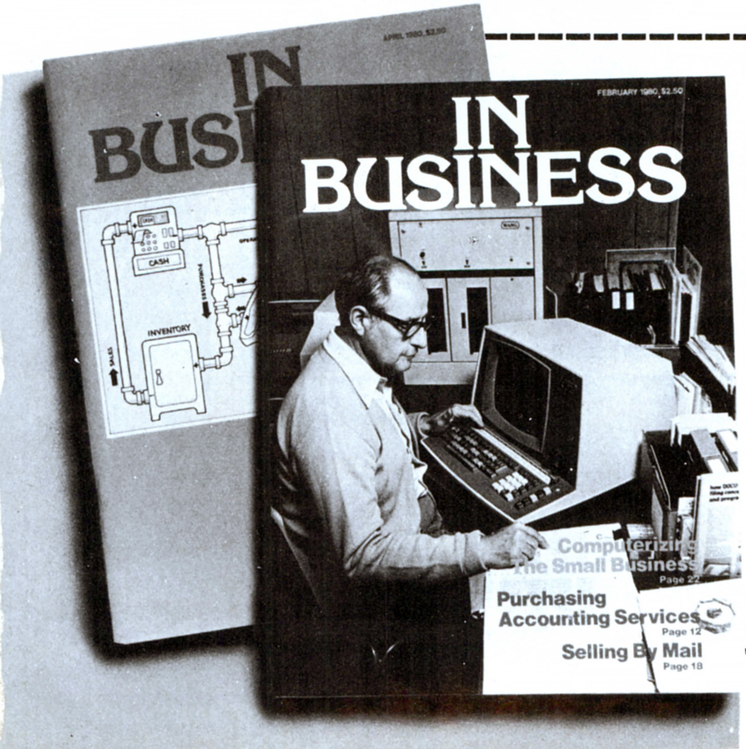

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Full Pack Memory— or 64K on a Board

A review of Measurement Systems & Controls' 6400 series 64K dynamic memory boards

by Roger H. Edelson

A new kid on the S-100 block has recently announced, and more importantly is shipping, full single board 64K dynamic memories. The boards, designed by Measurement Systems & Controls, Orange, CA, around the 4116 dynamic RAM integrated circuit, are available in two formats—with or without bank select. I received both for review and as the boards are really quite different (except for the memory chip), I will review the DM6400 now and the bank select version next month.

I must confess to mixed feelings about this board. On one hand it deserves high marks for what it does, but must be faulted for what it leaves out. Further, I have a philosophical bias against dynamic memories, undoubtedly due to my experience in space and military design.

Dynamic memory does have a finite bit error rate attributable to alpha particle events. Because of this, no dynamic memories are presently used in space hardware. It is possible that this bias shouldn't extend to commercial use, but I am stuck with it. A compromise might include single bit error detection and correction circuitry, as integrated circuit sets designed for this purpose are now readily available from at least two major IC companies.

At a minimum, a dynamic memory board should have parity detection and provision for an interrupt on parity error. The DM6400 has neither, but its 64K of memory leaves room for little else. However, I experienced no memory failures during my tests.

Beyond my quaint prejudices, what are the good and bad points of this board? The assets: First, it provides all the memory the more popular microprocessor chips can directly use—without bank select. Second, much of the circuit design is innovative and excellent—including built-in noise filters/terminations for the S-100 address and critical control lines. Third, the design and construction of the board is top notch—

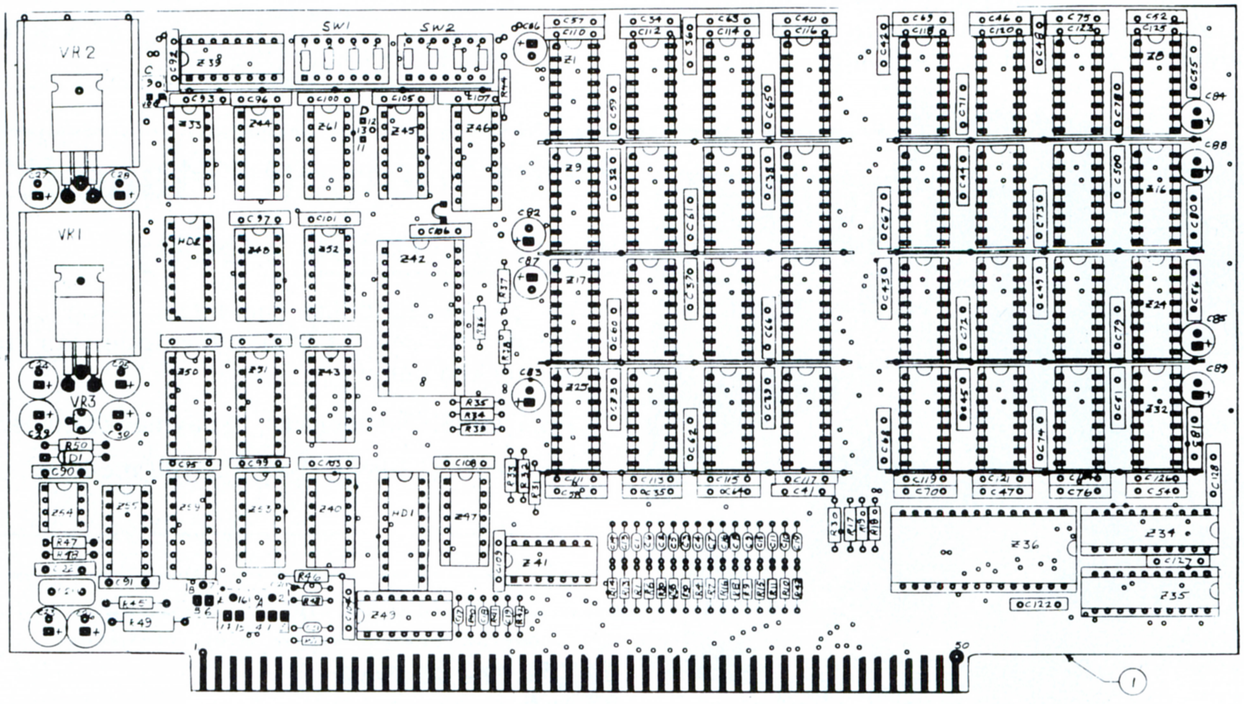

Figure 1. DM6400 design and layout.

from its gold-plated edge connectors to the excellent solder masking and component identification. Also, the technical manual is readable, complete and includes full circuit and timing diagrams.

On the debit side, the technical manual states, "The board follows the conventions established by early S-100 bus users as well as the latest attempt by the IEEE to standardize the S-100 bus." This is not the case. There is absolutely no provision for this board in 16-bit systems. While the pins for sXTRQ and SIXTN are not used for any other signal, neither are they connected to 8/16-data transfer protocol circuitry. For this reason, the board, and bank-select could only be purchased for 8-bit memory systems.

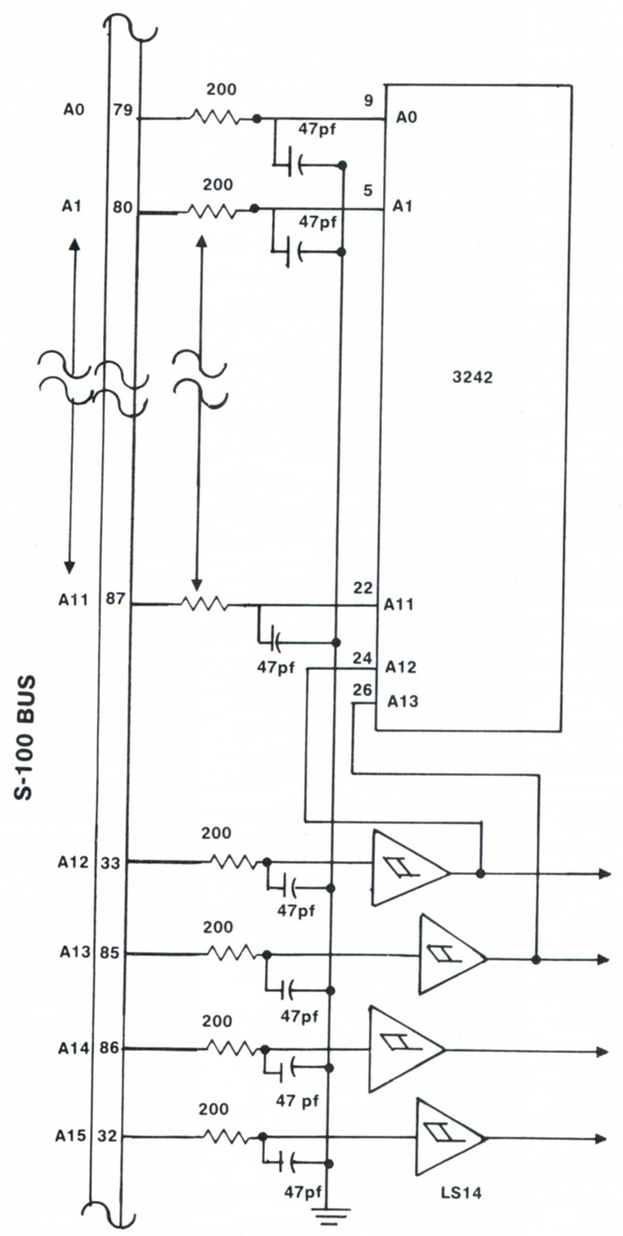

Figure 2. Noise filters/terminations circuit design.

This caveat is not too restrictive considering the lack of widespread use of the newer 16-bit chips—and the even less availability of supporting software. With regard to the electrical loading and timing specification,

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the board meets all requirements with signals buffered and/or isolated directly upon entering the board. Bus signals are never required to drive more than one TTL load. This design is exceptional and should be copied.

Well planned design

Before diving into the circuit design and theory of operation, let's look at the physical design and layout. Figure 1 shows the layout, but doesn't really do justice to the clean, well thought out design. The filters for the S-100 bus address lines and critical control signals are located less than an inch from the board edge connector to provide good termination for high frequency signals and noise spikes.

The memory address selection (and deselection) switches, SW1 and SW2, are located at the top edge of the board to allow easy access while the board is in place. Referring to the layout diagram, those strange lines beneath each group of four 4116 chips are the raised +12V bus bars—a clever solution to a difficult layout problem. Also, as can be inferred from the layout, extensive filtering of both the Vcc and the +12V supply has been provided; one 0.1-ufd capacitor is provided for each chip for Vcc filtering along with additional electrolytics.

The board jumper selection areas are well marked both on the board and on the layout diagram. The manual does an excellent job describing these jumper selections and detailing the changes required for particular user setup requirements.

The circuit design features built-in noise termination of critical signals and single gate loading of all signals.

Figure 2 illustrates the design of the noise filters and terminations, and the buffering technique used for the S-100 address lines. A single P3242 (or MC3242) 16K dynamic RAM address multiplexer and refresh counter, whose logic diagram is shown in figure 3, is used to reduce the component count. The S-100 address lines A0 thru A11 are directly connected to this chip through the noise filters consisting of a series of 200-ohm resistor and 47-pfd filter capacitor. As address lines A12 and A13 are also used in the chip select design, buffered with individual LS14 Schmitt triggers and the same type of noise filters.

Both integrated circuits meet the bus receiver specification for high and low states given in the proposed IEEE standard. Besides the address signals, four addi-

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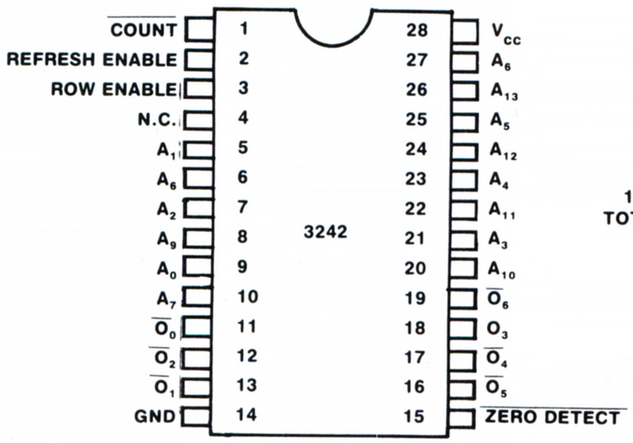
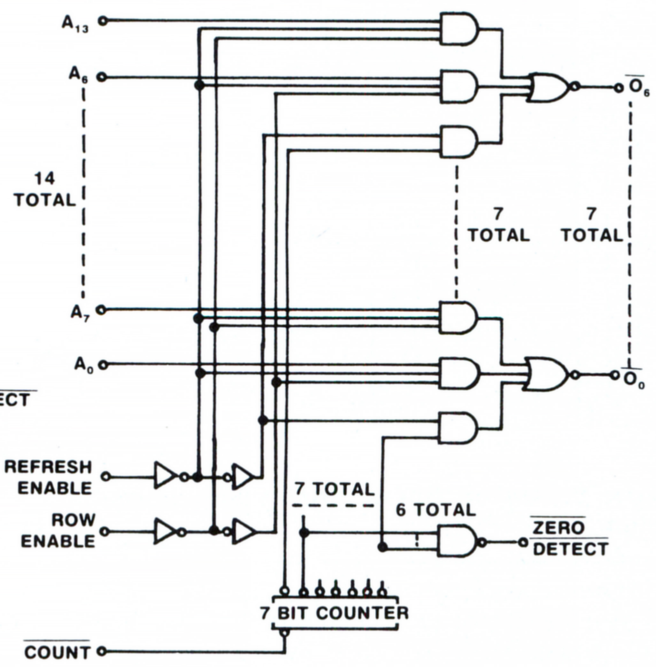
PIN CONFIGURATION


$\overline{COUNT}$ 1
REFRESH ENABLE 2
ROW ENABLE 3
N.C. 4
A_1 5
A_6 6
A_2 7
A_9 8
A_0 9
A_7 10
$\overline{O}_0$ 11
$\overline{O}_2$ 12
$\overline{O}_1$ 13
GND 14
28 V_{CC}
27 A_6
26 A_{13}
25 A_5
24 A_{12}
23 A_4
22 A_{11}
21 A_3
20 A_{10}
19 $\overline{O}_6$
18 O_3
17 $\overline{O}_4$
16 $\overline{O}_5$
15 $\overline{ZERO\ DETECT}$
3242

NOTE: A_0 THROUGH A_6 ARE ROW ADDRESSES.
A_7 THROUGH A_{13} ARE COLUMN ADDRESSES.

LOGIC DIAGRAM


A_{13}
A_6
14 TOTAL
A_7
A_0
$\overline{O}_6$
7 TOTAL
7 TOTAL
$\overline{O}_0$
REFRESH ENABLE
ROW ENABLE
7 TOTAL
6 TOTAL
$\overline{ZERO\ DETECT}$
7 BIT COUNTER
$\overline{COUNT}$

TRUTH TABLE AND DEFINITIONS:

REFRESH ENABLE	ROW ENABLE	OUTPUT
H	X	REFRESH ADDRESS (FROM INTERNAL COUNTER)
L	H	ROW ADDRESS (A_0 THROUGH A_6)
L	L	COLUMN ADDRESS (A_7 THROUGH A_{13})

$\overline{COUNT}$ - ADVANCES INTERNAL REFRESH COUNTER.
$\overline{ZERO\ DETECT}$ - INDICATES ZERO IN THE FIRST 6 SIGNIFICANT REFRESH COUNTER BITS (USED IN BURST REFRESH MODE)

Figure 3. 3242 logic diagram.

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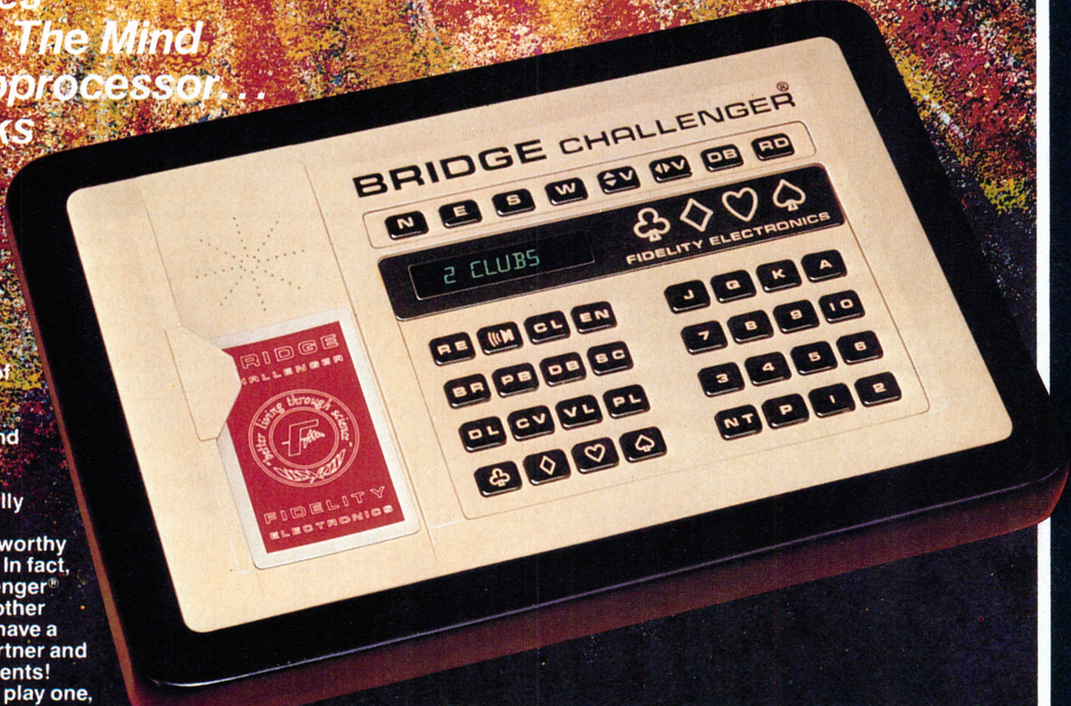

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tional S-100 control lines (preset, mwrite, psync, and smi) are terminated in the same method using Schmitt triggers and noise filters.

The board meets the IEEE proposed specification for the use of a single timing signal to reference all system signals—pin 24, the 8080 02 clock line is used. The board itself has a main memory clock generated from a 25 mHz crystal oscillator circuit used to synchronize the bus signals to the internal clock timing.

The board provides switches to allow either the selection or deselection of blocks of memory with a minimum size of 4K. Table 1 defines the codes for the selection and deselection logic switches. This table merely illustrates the ability to operate on either 4, 8, 16, or 32K banks but does not show the SW-2 positions necessary for each address possibility.

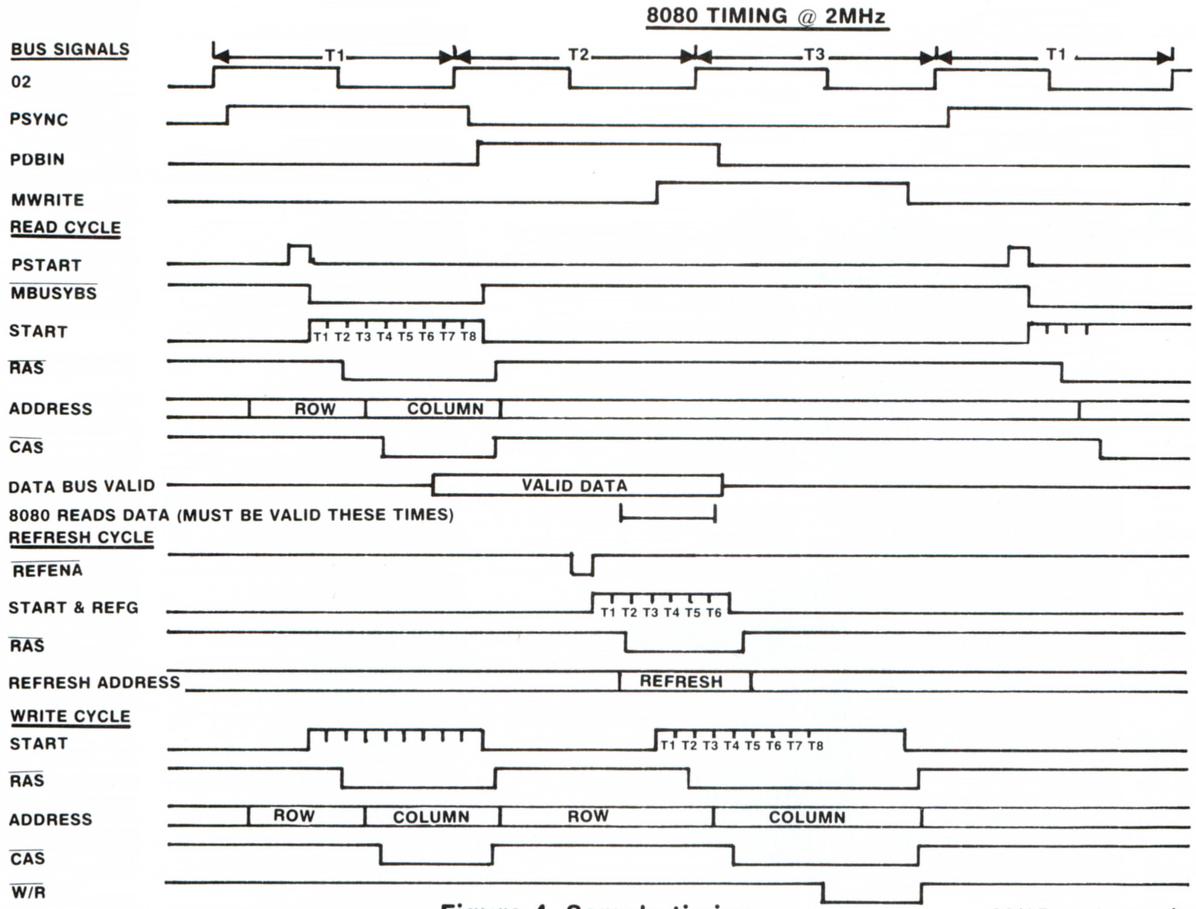
One problem with this scheme is the minimum size of memory that must be deselected. With a 4K minimum, use of this board in a North Star system means that 2K of memory is lost. This is not too large a penalty to pay for having all 64K on one board, however. Operation with the phantom line (pin 67) has been provided for on this board along with the option of removing this function if your system uses pin 67 for some other function. The phantom line is implemented simply by disabling the LS373 octal latch used as an output buffer.

One of the problems of designing for the S-100 bus is the proliferation of different systems...

One of the problems of designing for the S-100 bus is the proliferation of different systems each with a particular share of the marketplace. In order not to be limited in applications, it is necessary to make new designs with the ability to be compatible with the other various implementations. This problem is particularly acute in the design of memory boards because of the peculiar interactive timing constraints.

The DM6400 achieves this compatibility through the use of two configurable headers. The possible selections for header 1 and header 2 are given in table 2. All major CPU types are represented in the configuration tables including 2 and 4 mHz operation as well as the latest revision of some CPUs.

The design of this board is based on the requirements of the 4116 16K by 1-bit memory chip. Thirty-two of these integrated circuits are required to produce a full 64K by 8-bit wide memory system. Memory refresh timing is provided mainly by a 3480 timing and refresh circuit and the required address multiplexing is obtained, as mentioned previously, by the use of the P3242 device. An LS169 counter provides the various timing signals required by the 3480 chip. As the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BUS SIGNALS
02
PSYNC
PDBIN
MWRITE
READ CYCLE
PSTART
MBUSYBS
START
RAS
ADDRESS
CAS
DATA BUS VALID
8080 READS DATA (MUST BE VALID THESE TIMES)
REFRESH CYCLE
REFENA
START & REFG
RAS
REFRESH ADDRESS
WRITE CYCLE
START
RAS
ADDRESS
CAS
W/R
T1
T2
T3
T1
T1 T2 T3 T4 T5 T6 T7 T8
ROW
COLUMN
VALID DATA
T1 T2 T3 T4 T5 T6
REFRESH
T1 T2 T3 T4 T5 T6 T7 T8
ROW
COLUMN
ROW
COLUMN
SCALE: ←200ns→

Figure 4. Sample timing.

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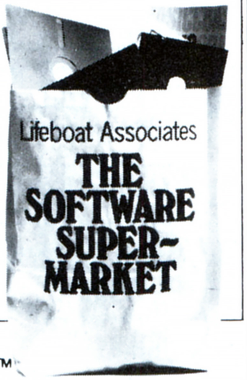

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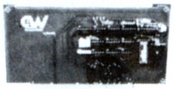

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Table 1. Header selections.

Header No. 1

1. RDEN	to	SMEMR or PDBIN
2. STARTISEL	to	RDENB or PU-3
3. REFEN	to	SM1B or 8080 REF
4. START2SEL	to	SM1B or PU-3
5. MBRSEL	to	T6, T7, or T8
6. T4SEL	to	T6, T7, or T8
7. OBCKSEL	to	T8 or START

Header No. 2

1. PSYNCSEL	to	PSYNCB, D1, D2, D3 or PU-2
2. DSRSEL	to	PSYNCB or PSYNCB
3. WAITSEL	to	D5, D6, D7, D8, or INVOUT
4. INVIN	to	PSYNCB, D3, D4, D5 D6, or D7

counter is synchronous, these timing signals are directly synched to the basic 25 mHz board clock used as the clock input to the counter. Figure 4 shows the board timing relationships for some popular Z80 CPUs operated at 2 mHz. The refresh cycle is transparent to all CPU boards as it is performed during an unused time in the basic CPU timing.

After the refresh cycle has been initiated, it is identical for any CPU board. A transparent design removes the requirement that the CPU chip must perform some function in the refresh cycle; this minimizes operational problems that would otherwise occur with the use of dynamic memories. Early attempts at the use of dynamic memory chips did suffer some operational penalties because the memory refresh timing was not transparent.

Table 2. Valid select/deselect codes

The following abridged tables define all the valid codes for the selection and deselection logic.

Description	SW-1	SW-2
	A B C D	A B C D
16 - 4K byte BANKS	1 1 1 1	x x x x
8 - 8K byte BANKS	1 1 1 0	x x x 0
4 - 16K byte BANKS	1 1 0 0	x x 0 0
2 - 32K byte BANKS	1 0 0 0	x 0 0 0

Selection Code

Description	SW-1	SW-2
	A B C D	A B C D
16 - 4K byte BANKS	0 1 1 1	x x x x
8 - 8K byte BANKS	0 1 1 0	x x x 0
4 - 16K byte BANKS	0 1 0 0	x x 0 0
2 - 32K byte BANKS	0 0 0 0	x 0 0 0

Deselection Code

Purchasers contemplating changing to any of the 16-bit CPUs, or who cannot tolerate a possible memory error, should shy away from this unit. On the other hand, systems that will never use anything but an 8-bit CPU (an 8080, Z80, 8085, or even a TMS 9900), and do not mind an occasional glitch, should definitely consider it. For $650 it's an excellent product. ☐

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IBM's 5120: High Price... High Style

by Tom Fox

The 5120 is the smallest, least expensive, general purpose computer IBM ever produced. And it's being marketed with a vigor unusual even for the well-heeled computer firm. But it doesn't come cheap. IBM is putting a lot of faith in its capabilities—even altering some fundamental marketing practices.

A radio advertisement offers a free 3-hour computer seminar. No strings, just come on down and learn the basics of computing and—not so coincidentally—how the 5120 can become a meaningful addition to a small business.

The Business Computer Center we visited was superbly equipped to put on the show. A comfortable mini-auditorium and large-screen computer display reflected a slick multi-media presentation hosted by sharp, pin-striped men and women. Sales talk, of course, was an indispensible part of the program.

So what was it all about? In essence, we learned that the 5120 is an average-performing micro with a higher-than-average price tag, but promises absolutely superb after-sales support.

The main unit encases in plastic almost everything needed to perform the processing activities. Only the printer is separate. Visible features of the main housing are the display screen, typewriter-like keyboard and a pair of vertical slots to hold the floppy diskettes. The unit is a mild, almost colorless two-tone gray; few office decors can clash with that.

The keyboard could hardly be improved, which is to be expected given IBM's typewriter dominance. It includes an adding machine-like numeric keypad on the right, and individual left, right, up and down keys for screen editing. In addition to the normal and shifted characters, most keys have a 'command' function. In the 5120, it is identified by a special legend on the front edge of the key, and just above the top row of keys.

The built-in floppy diskette drives feature a simple, positive mechanism for locking the diskettes in place, a quarter-turn of the large, visible locking bar is all that is needed to load or unload.

The diskettes contain data on both sides in double-density format. Each side can hold approximately 625,000 bytes (characters) of information. Since there are two drives, a total of 2.4 million bytes are available for immediate access by the programs.

The diskettes are soft-sectored, and can be formatted with 128, 256, 512 or 1024 byte sectors. The standard applications programs utilize the 512-byte convention. IBM says that the average access time for a random piece of data anywhere on a diskette is 0.25 second. This puts it on the slow side of the competition.

Internally, the 5120 contains proprietary microprocessor circuitry that IBM typically is reluctant to describe. The simplest query (is the micro of 8- or 16-bit design?) went unanswered. We did learn that the CPU runs slightly slower than 2 mHz, about half the speed of the 8-bit Z-80.

The 5120 can be purchased with either 16, 32, 48 or 64K bytes of RAM. All but some 4500 bytes are usable, since much of the software is contained on separate read-only memory chips. This includes the disk operating system, an optional data sorting program and Basic and APL language interpreters. Up to 200K bytes of read-only storage (ROS), as IBM calls it, can be incorporated.

The 5120 offers a choice of two hard copy, dot matrix printers. Both are serial in design, which means that characters are formed one at a time by moving the print head. The standard printer operates at 120 cps, but a lower-cost 80 cps unit is available for those watching a budget.

Curiously, IBM does not offer a typewriter-quality printer. This void is complemented on the software side by a dearth of text editing or formatting programs that would allow the 5120 to double as a word processor. It's our guess that this is a ''deliberate oversight'' to keep the 5120 from competing against IBM's word processing equipment. Given the proper printer and software, there is no reason the 5120 could not become a decent word processor, even though the small display screen doesn't measure up to standard dimensions.

Basic is the basis for the majority of 5120 programs. IBM's Basic is, understandably, well suited for business applications. It can be utilized in concert with the optional diskette sorting program (supplied in ROS). The language sports an excellent imbedded screen-oriented editor that makes program alterations easy.

We ran our prime number cruncher benchmark (IA Jun 80) on the 5120 and came up with a disappointing 1956-sec. score. This puts the tiniest IBM near the bottom of our list, slower even than a $700 TRS-80. IBM is quick to point out that such a simple and specialized test is a poor overall ''figure of merit'', and only tells a small part of the story. It's right, of course.

Software available

For scientific applications, the 5120 can be shifted into an APL machine with the flick of a switch. APL is one of IBM's most endearing products. It has a small but absolutely dedicated following in the scientific and engineering sectors.

Applications programs are IBM territory. There are two classes of business software: financial and asset management. Financial includes accounts payable, payroll and general ledger. Asset management packages are accounts receivable, inventory control and billing. In addition, the Business Computer Centers have a growing list of software houses that have been developing specialty packages ever since the machine became available.

''Impressive'' hardly does justice to the mass of books included to describe the system. *5120 Setup Procedure,* a 36-page check-the-boxes pamphlet, is heavily illustrated to aid in unpacking the machinery, connecting it to a power source and otherwise preparing it for use. *General Information and Site Preparation* should be read before deciding on purchase. These

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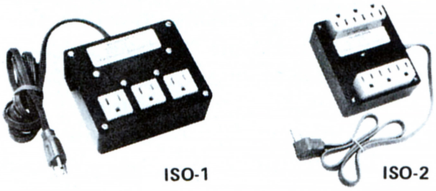

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together with the ½-inch thick *Operator Training Book* leave nothing to interpretation, and are written for a person totally ignorant of computers.

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Instructions, documentation galore

Documentation for the software products is equally overpowering. Each package is delivered with its own instructional audio program, as well as at least three operations manuals: *Getting Ready, Reports and Information* and *Operator Training*. IBM is perhaps the world's most experienced firm in making computers fit into noncomputerized business operations. The software documentation plays a large part in its success, and should serve as a model to others.

One of the major worries to a computer purchaser these days is whether or not the manufacturer will be in business when the equipment inevitably breaks down months or years in the future. We'll bet on IBM outlasting everyone.

Further, we'd expect it to continue servicing the 5120s so long as the systems perform useful work. IBM is promoting this competitive edge to the hilt. How many other computer manufacturers offer a toll-free hotline for hardware *and* software failures? Repair service isn't free, but it's *available*—a novelty in the micro industry.

It's possible to purchase a bare-bones 5120 for as little as $9,160, but even the slipperiest IBM salesman wouldn't recommend it. Add a 120 cps printer, the diskette sort option and enough memory to bring it up to 32K bytes, and you arrive at the most popular configuration listing for $13,375. APL instead of Basic adds an $830 premium; ordering both at once costs $1,660. The final 32K bytes of RAM (not needed for any of the standard IBM software packages) will tack on $1,570.

If you're really counting pennies, the slower 80 cps printer saves $415. Additional diskette storage comes at $3,445 for the third 1.2M-byte drive; $1,710 for the fourth and final one. Various data communications options are available at prices ranging from $270 to $1,800.

Applications software is rentable (a typical IBM practice) on a monthly basis. Each major package adds $60 to the monthly bill. The license fee is waived after the 24th payment, but programs cannot be owned outright. It amounts to software payments totaling $1,440 spread over two years.

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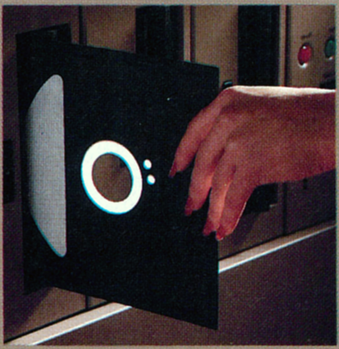

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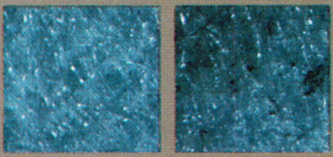

A Scotch cleaning diskette shown before use, and after 15 cleanings of recording heads.

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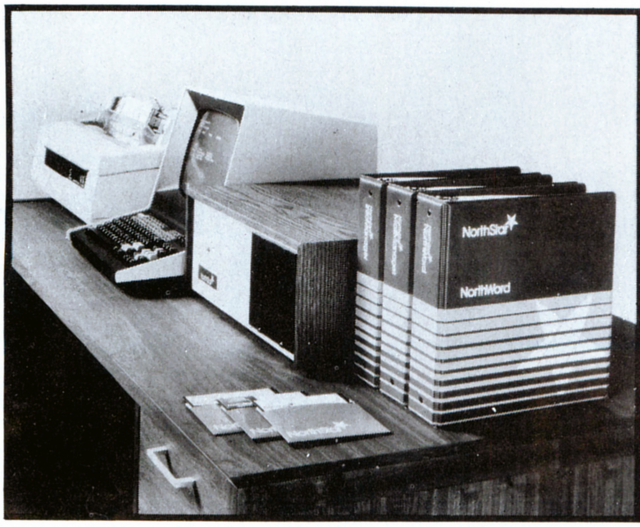

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by Hillel Segal

While the affordability of computers has increased tremendously in the last decade, the task of selecting, programming and installing a system for business use is much the same in today's small systems world as it was back in the heyday of mammoth mainframes.

In fact, the whole startup process may today be even more difficult, in some ways. Nowadays, there are dozens of small computers and hundreds or even thousands of software packages for various applications. New firms are just starting up, while others are going broke. Technology itself evolves in new directions from year to year. In the midst of such rapid change, and with so many alternatives to choose from, how can the average businessman, educator, or home computer user make a rational decision?

In this column, I intend to tackle these issues head-on, focusing on the difficult task of comparing the performance of various systems. Our comparisons will be based on benchmark test reports published by the Association of Computer Users. With the results of these tests, you'll have at least the beginnings of a meaningful performance comparison.

This month, we'll examine the North Star Horizon, one of the systems tested in our Series #1 Benchmark Reports, that cover a dozen complete systems priced under $15,000. But first, some general comments on the role of the performance comparisons.

It would be wonderful if we could somehow point to one particular computer and say with certainty, "This is the best." But realistically, such a statement could only be made by a simpleton. There is no "best" computer—or even a best manufacturer. Just as the Rolls-Royce, Ferrari, and Volkswagen serve different transportation needs, so does a TRS-80 differ from a Wang, Hewlett-Packard, or Apple in the type of computing application it was meant for and the features it offers. It's up to you as potential buyer to know what your organization requires, and which systems potentially fit those needs.

Obviously, the starting point has to be a definition of the purpose the computer will serve. It's not enough just to say, "I need a computer for my business," or "Our students have to learn programming." A detailed evaluation of the computing function, magnitude of the task, number of users, and rate of growth in the application are needed in order to even begin appraising specific systems.

With such a definition in hand, we can approach potential computer systems, checking four basic categories: features, software, performance, and support services. Unless you are confident that a given

CP/M* compatible software

SYSTEM MAINTENANCE

DIAGNOSTICS I: Easily the most comprehensive set of CP/M compatible system check-out programs ever assembled. Finds hardware errors in your system, confirms suspicions, or just gives your system a clean bill of health. Tests:

- Memory
- Disk
- CPU (8080/8085/Z80)
- Printer
- Terminal

To our knowledge the CPU test is the first of its kind anywhere. Diagnostics I can help you find problems before they become serious. A good set of diagnostic routines are a must in any program library.

Minimal requirements: 24K CP/M. Supplied with complete user manual: $60.00 Manual alone: $15.00.

ACCOUNTING

ACCOUNTS PAYABLE/RECEIVABLE: A complete, user oriented package which features:

automatic postings to general ledger (optional)

- accounts payable:
  - check printing with invoice
  - invoice aging
- accounts receivable:
  - progress billing
  - customer statements
  - partial invoice payments
  - invoice aging

The entire package is menu driven and easy to learn and use. It incorporates error checking and excellent user displays. This package can be used stand alone or with the General Ledger below.

Supplied with extensive user manual: $200.00. Manual alone: $20.00.

GENERAL LEDGER: A complete, user oriented package which features:

- Accepts postings from external programs (i.e. AP/AR above)
- Accepts directly entered postings
- Maintains account balances for current month, quarter, and year and previous three quarters
- Financial reports: trial balance, income statement balance sheet, and more.

Completely menu driven and easy to learn and use. Excellent displays and error checking for trouble free operation. Can be used stand alone or with Accounts Payable/Receivable above.

Supplied with extensive user manual: $200.00. Manual alone: $20.00.

Both require 48K CP/M, terminal with cursor positioning, home and clear home, one 8" disk or Two 5" disks. CBASIC2 required.

TEXT PROCESSING

TFS—Text Formatting System: An extremely powerful formatter. More than 50 commands. Supports all major features including:

- left & right margin justification
- dynamic insertion from disk file
- user defined macros
- underlining and backspace

TFS lets you make multiple copies of any text. For example: Personalized form letters complete with name & address & other insertions from a disk file. Text is not limited to the size of RAM making TFS perfect for reports or any big job.

Text is entered using CP/M standard editor or most any CP/M compatible editor. TFS will link completely with Super-M-List making personalized form letters easy.

Requires: 24K CP/M.

Supplied with extensive user manual: $85.00. Manual alone: $20.00.

Source to TFS in 8080 assembler (can be assembled using standard CP/M assembler) plus user manual: $250.00.

MAILING LIST

SUPER-M-LIST: A complete, easy to use mailing list program package. Allows for two names, two address, city, state, zip and a three digit code field for added flexibility. Super-M-List can sort on any field and produce mailing labels direct to printer or disk file for later printing or use by other programs. Super-M-List is the perfect companion to TFS. Handles 1981 Zip Codes!

Requires: 48K CP/M.

Supplied with complete user manual: $75.00. Manual alone: $10.00

UTILITIES

Utility pack #1: A collection of programs that you will find useful and maybe even necessary in your daily work (we did!). Includes:

CMP:	Compare two files for equality.
ARCHIVER:	Compacts many files into one, useful when you run out of directory entries.
SORT:	In core sort of variable length records.
XDIR:	Extended, alphabetical directory listing with groupings by common extension.
PRINT:	Formatted listings to printer.
PG:	Lists files to CRT a page at a time.
	. . . plus more . . .

Requires: 24K CP/M.

Supplied with instructions on discette: $50.00

PROGRAMMING LANGUAGES

FORTH: a full, extended FORTH interpreter/compiler produces COMPACT, ROMABLE code. As fast as compiled FORTRAN, as easy to use as interactive BASIC.

NEW!

SELF COMPILING: Includes every line of source code necessary to recompile itself.

EXTENSIBLE: Adds functions at will.

Z80 & 8080 ASSEMBLERS included

Single license, OEM licensing available

Please specify CPU type: Z80 or 8080

Supplied with extensive user manual and tutorial: $150.00

Documentation alone: $25.00

ENHANCED 'TINY' PASCAL: We still call it 'Tiny' but it's bigger and better than ever! This is the Famous Chung/Yuen 'Tiny' Pascal with more features added. Features include:

- recursive procedures/functions
- FOR (loop)
- IF . . . THEN . . . ELSE
- READ & WRITE
- integer arithmetic
- sequential disk I/O
- WHILE
- REPEAT . . . UNTIL
- CASE
- one dimensional arrays
- 'PEAK' & 'POKE'
- more

'Tiny' Pascal is fast. Programs execute up to ten times faster than similar BASIC programs.

SOURCE TOO! We still distribute source, in 'Tiny' Pascal, on each discette sold. You can even recompile the compiler, add features or just gain insight into compiler construction.

'Tiny' Pascal is perfect for writing text processors, real time control systems, virtually any application which requires high speed. Requires: 36K CP/M. Supplied with complete user manual and source on discette: $85.00.

Manual alone: $10.00.

SOFTWARE SECURITY

ENCODE/DECODE: A complete software security system for CP/M. Encode/Decode is a sophisticated coding program package which transforms data stored on disk into coded text which is completely unrecognizable. Encode/Decode supports multiple security levels and passwords. A user defined combination (One billion possible) is used to code and decode a file. Uses are unlimited. Below are a few examples:

- data bases
- payroll files
- programs
- general ledger
- correspondence
- tax records
- inventory
- accounts pay/rec
- mailing lists

Encode/Decode is available in two versions:

Encode/Decode I provides a level of security suitable for normal use. Encode/Decode II provides enhanced security for the most demanding needs. Both versions come supplied on discette and with a complete user manual.

Encode/Decode I: $50.00

Encode/Decode II: $100.00 Manual alone: $15.00

INTERCOMPUTER COMMUNICATIONS

TERM: a complete intercommunications package for linking your computer to other computers. Link either to other CP/M computers or to large timesharing systems. TERM is comparable to other systems but costs less, delivers more and source is provided on discette!

With TERM you can send and receive ASCII and Hex files (COM too, with included convertion program) with any other CP/M computer which has TERM or compatible package. Allows real time communication between users on separate systems as well as acting as timesharing terminal.

- Engage/disengage printer
- terminal mode for timesharing between systems
- send files
- error checking and auto retry
- conversational mode
- receive files

Requires: 32K CP/M.

Supplied with user manual and 8080 source code: $110.00

Manual alone: $15.00.

CP/M Formats: 8" soft sectored, 5" Northstar, 5" Micropolis Mod II, Vector MZ

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CIRCLE INQUIRY NO. 63

system can offer what you need in all four areas, you'd best leave it alone.

By features, I mean the sort of thing you'll see in an advertisement: "dual 8-inch floppy disks for data storage," or "full color graphics included." From your definitions of needs and future growth, you should know whether the system has adequate storage capacity, whether it offers the right type of printer, and so on.

Next, consider the software. If your application is, shall we say, a general business accounting system, then you'll need to see the type of "books" each potential system would keep for you. Unless it happens to be just what you want, then some modifications must be made. Are you a programmer? If not, then someone will have to do the job for you. Be sure you know exactly who that is and how much the needed programming will cost...as well as whether debugging will be guaranteed in the final price you pay for the total system.

Support services you'll need include maintenance of the hardware, technical help to answer programming and operational problems, and training for you and your staff. Companies like IBM stake their reputations on good support services, and the success of these firms is a good indication of how important the area of support is to the computer user.

Finally, assuming the above categories are met, you should consider performance. Here, most users have largely been forced to rely on word-of-mouth reports from customers, a bewildering array of manufacturers' specifications, or expensive reports by industry consultants. It is in this area of performance that the Association of Computer Users has taken a leadership role, and our findings will form the basis for this continuing column.

Our benchmark tests, performed for the ACU by independent consultants, are a set of standard programs that can be run on any system. All are written in Basic since that language is most commonly available. By timing the execution of these programs on different computers, we can get a fairly accurate estimate of performance. In these columns, I'll be reporting on one particular test—the accounts receivable problem. It was designed to resemble an actual business applications program and exercises math, logic and disk drive functions of the computer—the same things you would need in everyday use.

In our testing program we have found results which disprove an assumption many tend to make when comparing computer systems...the belief that systems priced in the same range will deliver similar performance. A corollary to that assumption is that if you pay more, you'll get more.

Neither one of these common-sense dictums has withstood the acid test—actual performance in our benchmark studies. We have found incredible differences in run time when comparing systems priced just about the same. Only an actual examination of performance under real-life conditions can reveal what the capabilities of a system are.

For a complete system priced under $7,000, the North Star Horizon produced benchmark test results that were quite surprising. Its run times challenged those of systems costing far more. And in comparing our studies of computers priced under $15,000, it is clear that the Horizon is a performance pace-setter.

The strength of the North Star showing is evident in the accounts receivable problem. Here, the Horizon's run time of 1:57.7 was better than any system tested during Series #2, our group of benchmark test reports which covered computers priced $15,000 to $25,000.

Included among those which North Star beat on this particular test are systems such as the Wang 2200VP, Hewlett Packard 250, and others.

The Horizon system was supplied with a Soroc-120 CRT terminal. Also included were a pair of minidiskettes, an Anadex printer, 64K bytes of memory, and a special module called the floating point arithmetic board. This optional module helped speed up the Horizon's execution of math functions.

The disk operating system and Basic interpreter are supplied at no extra charge, and the entire package was quoted at $6,911. Pascal is also offered.

Because the system is built around the S-100 bus, extra equipment is available from other manufacturers. Real-time clocks, digital to analog converters, music synthesizers, and other specialized items are available off-the-shelf.

The "mix and match" flexibility of the Horizon brings with it added responsibilities for the user. Each unit must be personalized according to the accessories, terminal, and printer that will be in use. The Horizon is not a ready-to-run system that can be taken out of the box, plugged in and turned on. You'll want help from the vendor.

North Star now sells software for word processing, automatic letters, general ledger, and data base management. But these are relatively new offerings; application software is an area which North Star did not enter until recently. Since we did not test the software, I can't comment on its adequacy or ease of operation.

While comparing systems directly through the benchmark testing process is an important way of providing a measure of raw computing power, it should be obvious that many factors are left out of the tests. The ultimate usability of the computer in a specific setting cannot be known without considering the software, specific features, and vendor support. We can help you avoid overpriced systems that are "slow as molasses," but that alone is not enough. It's up to you to make sure that what you get in a business computer system is what you actually need. ☐

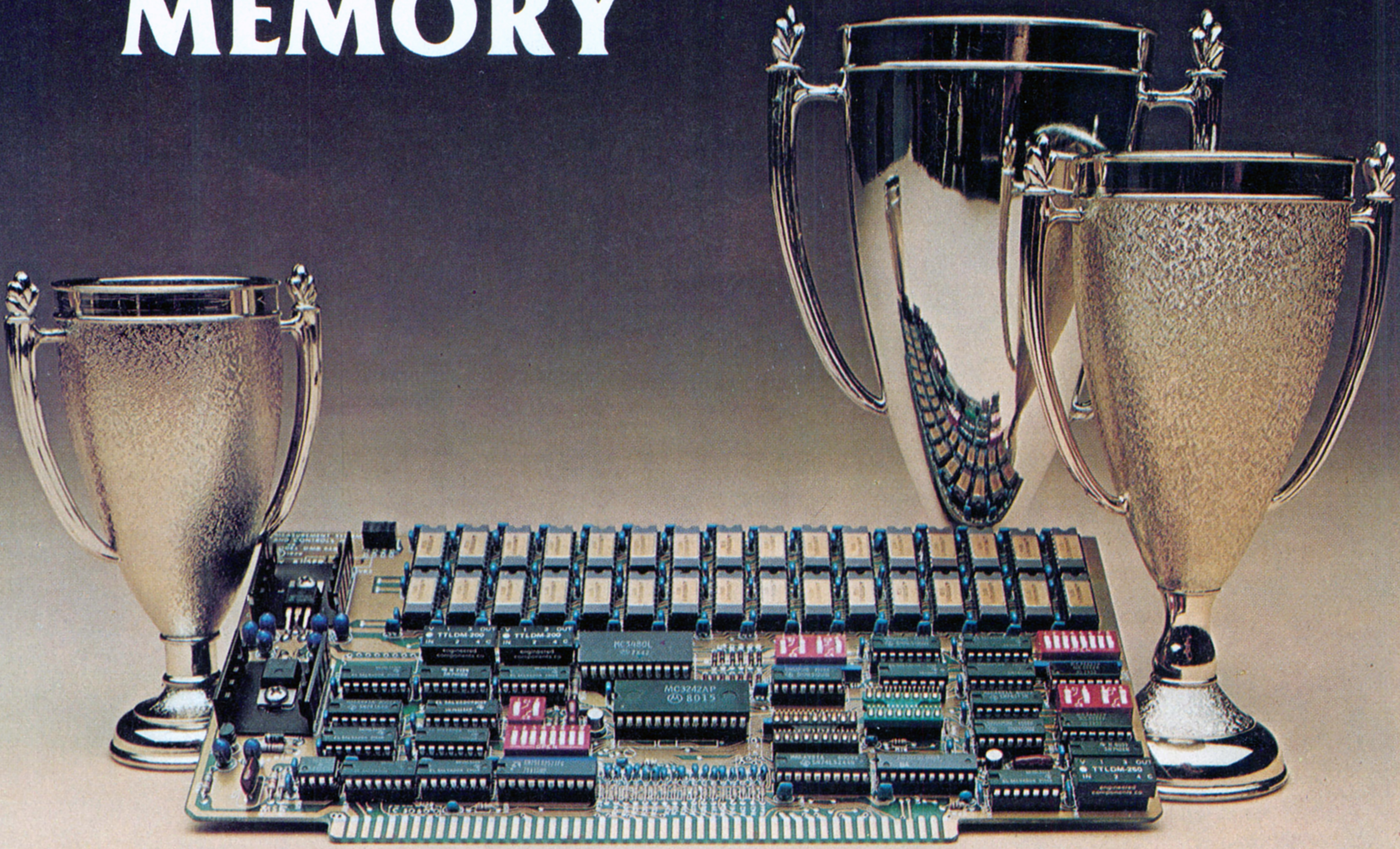
Hillel Segal is president of the Association of Computer Users, a nonprofit association with members all over the U.S., Canada and several other foreign countries.

One of the association's key activities is the publication of its "Benchmark Reports." Each month a new report is produced covering another computer system.

In addition, ACU publishes seven bimonthly newsletters for users of small computers, midi computers, large computers, time-sharing systems, distributed processing systems, word processing systems and home and hobbyist computers.

A complete set of sample copies of each of ACU's newsletters and complete information about membership is available at P.O. Box 9003, Boulder, CO 80301.

THE UNBEATABLE S-100 MEMORY



That's the MEASUREMENT systems & controls DMB Series of S-100 bus memory modules, fully compatible with **ALPHA MICRO**, **CROMEMCO**, **DYNABYTE**, **NORTH STAR**, **MP/M**, and most other S-100 systems.

Definitely a winner, the DMB Series is available with Bank Select (DMB6400) or without (DM6400) and utilizes industrial quality construction, provides outstanding reliability, and is backed by dedicated customer service and a one year guarantee.

The DMB6400 uses I/O port addressing for the bank select feature. A switch provides the ability to select any one of the 256 I/O ports for addressing the memory banks. The memory is configured as four totally independent 16K software selectable banks, with each bank addressable on any 16K boundary.

Outstanding features such as those listed below make the DMB series the UNBEATABLE S-100 Memory:

- Four independent 16K software selectable banks.
- Each bank is independently addressable on any 16K boundary.
- Switch selectable bank sizes — from 16K to 64K in 16K increments.
- Eight banks (512K) per I/O port for each of the 256 ports.
- Z-80 4MHz operation with no wait states using transparent refresh.
- On-board diagnostic LED's.
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- Reliable, tested and burned-in memory.
- IEEE S-100 compatible timing.
- One year guarantee.
- Attractive Dealer & OEM Prices.

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Software Review

MAGIC WAND VERSION 1.1

by Alan R. Miller

One of the most common computer activities is the processing of text in one form or another. Sometimes this involves the writing of reports, proposals, and form letters. At other times, it includes the generation of source programs for Basic, Pascal or Fortran compilers. In either case, the programs should be powerful, but also easy to use.

Two approaches are Electric Pencil and Word-Star (which will be reviewed in an upcoming issue), one-step programs that contain both an editor and a text formatter in the same computer program. Word-Star is unique in that the text appears in final form right on the video console as it is being entered. The user can immediately see the final placement of the text, as well as the page numbers, headings, etc.

The Magic Wand package consists of two separate programs: a text editor called Edit that generates the work file, and a text formatter called Print that creates the final document. It can be used with an ordinary serial video terminal or with a memory-mapped video screen. The package is available from Small Business Applications, Houston, TX; price is around $400. A minimum memory size of 32K bytes is recommended. At this time, the package must be configured by the dealer for each different video terminal and printer combination.

The 128-page user manual is unusually well written. It is printed with two columns per page, and the table of contents and index make it easy to find more information about a particular step. The use of the CP/M operating system is intelligently summarized for new users. In addition, there is a separate reference card that summarizes the commands for both editor and output formatter. The manual includes a set of lessons on disk that lead the beginner step-by-step through the many possible operations of editor and output formatter. The user starts the lessons by altering existing work files rather than by creating new files from scratch.

If you have not used a true video editor before, you are in for a surprise. The cursor can be moved anywhere on the video screen with the normal, cursor-positioning keys. Another key moves the cursor forward one full word at a time. Text can be scrolled up one line or down one line. It can also be scrolled up one screenful or down one screenful.

Pressing the home key once moves the cursor

to the beginning of the line. Pressing the home key a second time moves the cursor to the upper-left corner of the screen. Pressing the home key a third time puts the cursor at the bottom of the screen. The cursor can be moved eight spaces at a time with the tab key. One command moves the cursor to the beginning of the file and another moves it to the end.

Magic Wand buffers the keyboard input. The user can type several commands ahead and the program will not lose the information. The buffering feature is especially advantageous during scrolling. For example, if the screen-scroll key is pressed quickly four times, only the final screen is shown. You do not have to wait for each screen to be separately displayed.

Text corrections made simple

Text can be altered in many different ways. An incorrect character can be changed simply by moving the cursor to the mistake and overwriting it with the correct character. Single characters can be deleted with one key and whole words can be deleted with another. A third key can delete a complete line or the portion that lies to the right of the cursor.

There is a key to turn on the character-insert mode. Characters can be inserted one at a time. Character-insert mode is turned off by moving the cursor up, down, left, or right. Another command can be given to open up a section of the program for a massive insertion. During this full insert, the next line of text is displayed on the bottom line of the screen.

Global search and replace commands, typical of better editors, are also provided. At the conclusion of the multiple replacement step, a statement at the bottom of the screen gives the number of actual replacements performed. Finally there are block commands for manipulation of large sections of text. In this case, one marker is placed at the beginning of the block and another marker is placed at the end. If a move or a copy operation is to be performed, the cursor is put at the new location. The user then changes to command mode and gives one of the following:

BC	block copy
BD	block delete
BM	block move
BW	block write to disk
BK	kill block (markers)
PB	print block

Notice that the last command starts with P rather than B.

New text is entered without regard for the end of the line. When the end is reached, keep typing. If a word won't fit, the editor automatically drops it to the next line. The ends of paragraphs are indicated with a carriage return. If material is deleted from a line, the first word on the next line may jump up to the end of the current line.

Let's back up a bit and see how the edit step is initiated. The user begins with the system command:

```
EDIT FILENAME            or
EDIT OLDNAME NEWNAME
```

The first form is the usual edit command. It instructs the editor to get the requested filename, if it exists.

At the end of edit, the new file is given the original name and the original file is given the extension of BAK. On the other hand, if the requested filename does not exist, the user is asked to verify that the name given in the command line is correct. This is a good feature not usually found on micro editors. It avoids creation of a new file when the user simply misspells the name of an existing file.

The second form edits the original file of Oldname and creates a file Newname. Oldname is not altered.

The user is instructed to mount any necessary disks and press the return key. This step is useful for systems with only one drive, or with small-capacity drives. The command screen is displayed next, showing the name of the original file and the name of the new file. Additional statistics give the number of characters, the number of words and the number of lines (carriage returns actually) in a file. Also, the current line width and the tab-stop locations are shown. The line width is initially set to 80 columns, but it can be changed by the user at any time.

Pressing the return key switches to edit mode and the text is displayed on the screen. The user can return to command mode at any time by pressing the escape key. The full edit buffer can be printed on the list device by typing a P while in command mode. The result is a simple unformatted listing of the file. The right edge is ragged rather than aligned. Embedded format commands, if any, are also shown in this listing. Remember, this is the edit program not the format program.

Backup copies on disk should be made frequently during the edit session. Otherwise the entire file can be lost if the electricity goes out or if there is a computer malfunction. The dynamic save command is used for this purpose.

The edit session is completed by typing the word 'end' when in command mode. This is in contrast to the more usual command of E for most editors. If you inadvertently only type E, however, Magic Wand informs you that the word 'end' must be fully spelled out. This insures that the edit session will not prematurely abort.

After the work file is completed, it is formatted with the separate 'print' program. The execution command is:

```
PRINT FILENAME
```

As with the edit program, the user is asked to mount disks and press the return key. A set of options is displayed on the console along with the corresponding default values. Changes can now be made to the margin positions, the line spacing, page size, justification, etc. Printing is initiated with a carriage return, but it can be stopped by pressing any console key.

An alternate way to set up the format options is to embed them within the text. But they must be preceded by a special symbol to differentiate from regular text. Tex and Electric Pencil use a decimal point to indicate dynamic format commands, Textwriter uses an exclamation point, Magic Wand uses a backslash, but it may be easily changed to something else. Some of the more useful are:

LM	left margin	RM	right margin
PL	page length	PI	paragraph indent
TM	top margin	BM	bottom margin
JUST	justify text	CENTER	center text
SP2	double space	SP1	single space
NP	new page	FORMFEED	OFF
HEAD	heading size	FOOT	footing size
CTR	center line		

Continued on page 132

The Perfect Fit

The Micromodem II data communications system and the Apple II* computer. What better combination to maximize the capabilities of your personal computer!

This popular direct connect modem can transmit data between an Apple II and another Apple II, a terminal, another microcomputer, minicomputer or even a large time-sharing computer anywhere in North America. The Micromodem II has unique automatic dialing and answer capabilities which further increases the communications possibilities between the Apple II and another computer or terminal.

You can send and/or receive messages or data when you are out of your office, home or out of town. Your branch business locations can communicate with each other regarding inventory and other matters over the phone. Or you can communicate with friends across the country. And you can access information utilities like the SOURCE for various business and personal applications.

The Micromodem II consists of two parts. One part includes the printed circuit board which holds the Micromodem II, ROM firmware and the serial interface. The board plugs directly into the Apple II providing all the functions of a serial interface card plus programmable auto dialing and auto answer capabilities. The on-board ROM firmware enables the Micromodem II to operate in any of three modes to perform different tasks-terminal mode, remote console and program control mode.

The other part of the Micromodem II datacomm system is a Microcoupler which connects the Micromodem board and Apple II to a telephone line. The Microcoupler gets a dial tone, dials numbers, answers the phone and hangs up when a transmission is over. There are none of the losses or distortions associated with acoustic couplers. The Microcoupler is compatible with any North American standard telephone lines and is FCC-approved for direct connection in the U.S. It works with standard dial phone service or Touch-tone service.

The Micromodem II is completely compatible with Bell 103-type modems. Full and half-duplex operating modes are available as well as speed selectable transmission rates of 110 and 300 bps.

Why not increase your Apple II's capabilities by outfitting it with the sophisticated Micromodem II data communications system? The Micromodem II is available at retail computer stores nationwide. For the store nearest you, call or write:

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Inventory File Construction & Maintenance

by Chuck Atkinson

An inventory control program can improve productivity in a retail business. A computer can be used to assist the parts department manager in getting the job done more effectively. The program that follows is used for the daily business of buying and selling parts. Its features:

- Post parts quantities automatically upon arrival
- Post parts sales, quantity and amount
- Produce purchase orders
- Record suppliers' names, addresses and phone numbers
- Quickly display the status of an individual part
- Keep track of lost sales
- Print listings in correct order for inventory checks, price lists and parts catalogs (numerical or alphabetical)
- Total the dollar value automatically

The system required to run the program consists of a microprocessor, two disk drives (A and B) and a printer.

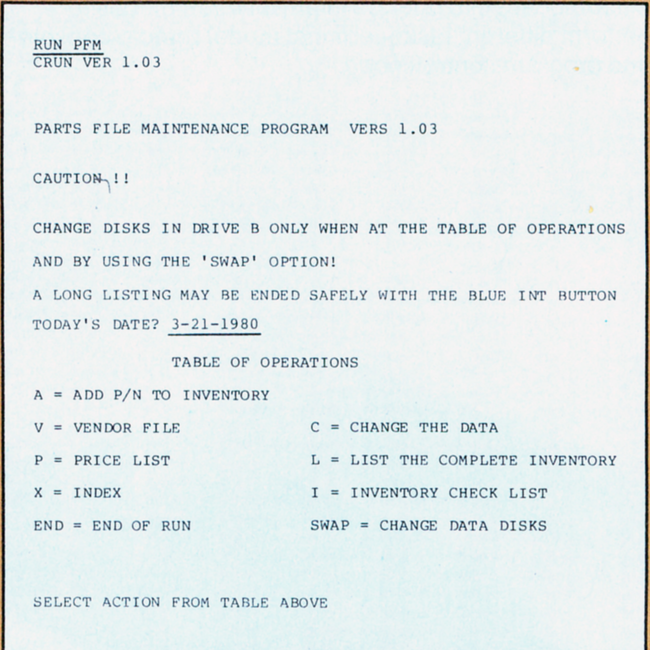
The program on the disk in drive A operates on a file in drive B. The file disk will hold the records for over 3200 individual part numbers. There is no limit to the number of disks that may be used for recording part numbers; however, it becomes a nuisance if the disks must be 'swapped' too often.

This article describes the program required to construct and maintain the inventory file on drive B. The complete source code, written in Commercial (CBasic) Basic, is listed at the end. A person requires little training to use the program. A Table of Operations is displayed before each action from which the operator makes a selection (figure 1). The operator entries are underlined for clarity. The other information printed here is displayed only on the screen during normal operation. A choice of yes or no is made by the operator each time printed output is available.

The program is called with the entry 'run PFM' (or 'crun'). The 'crun' version is displayed followed by the program title and a caution note about exchanging disks in drive B. If less than 3200 part numbers are to be filed, this caution may be removed since all the parts will reside on a single disk. This is the most efficient way to operate. (This assumes 320K per disk. Divide the number of bytes by 80 to get the absolute maximum number of records per disk.)

The date is entered as a string and the format is not critical. Acceptable examples are: 3-21-1980, 3 March 80, 3.21.80. This eliminates a lot of nuisance errors by an operator new or unfamiliar with the program.

The Table of Operations is displayed on the screen followed by the request to 'select action from table above'. Each option will be explained along with an example.



```
RUN PFM
CRUN VER 1.03


PARTS FILE MAINTENANCE PROGRAM  VERS 1.03

CAUTION!!

CHANGE DISKS IN DRIVE B ONLY WHEN AT THE TABLE OF OPERATIONS

AND BY USING THE 'SWAP' OPTION!

A LONG LISTING MAY BE ENDED SAFELY WITH THE BLUE INT BUTTON

TODAY'S DATE? 3-21-1980

              TABLE OF OPERATIONS

A = ADD P/N TO INVENTORY

V = VENDOR FILE                C = CHANGE THE DATA

P = PRICE LIST                 L = LIST THE COMPLETE INVENTORY

X = INDEX                      I = INVENTORY CHECK LIST

END = END OF RUN               SWAP = CHANGE DATA DISKS


SELECT ACTION FROM TABLE ABOVE
```

Figure 1. Start and table of operations.

The Table of Operations offers the options of adding, changing, listing or indexing the parts file. The vendor file contains the information for the parts sources. These are manufacturers or distributors that sell to the retail store.

When first constructing the parts file, each part number must be added to the file (figure 2). Select A and hit 'return'. The display will show the number of part numbers in the file. Initially, it will start with 1 and automatically increase the total each time a part is added. This count is maintained in record number 1 and speeds up the operation of the program considerably.

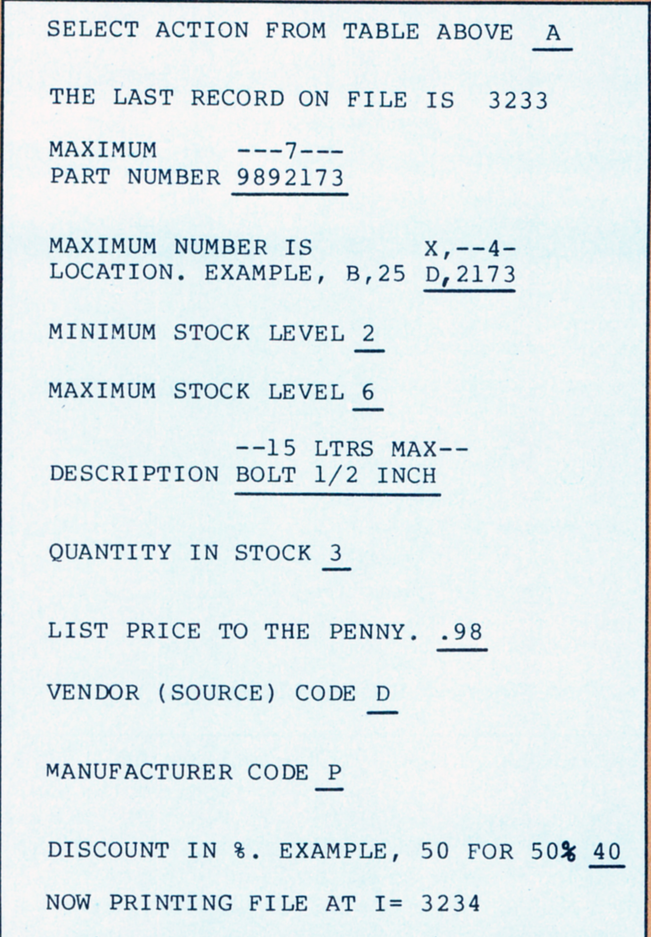
The first piece of information recorded is the part number. The maximum of 7 digits is displayed above the number being entered as a constant reminder not to exceed the field allowed. You may encounter parts in your inventory that require more than 7 digits. If so, change this portion of the source code to suit your application; 7 digits is usually adequate.

Insuring good control

Next, enter the location. This is the foundation of good inventory control (a place for everything and everything in its place?). The system used in this program is based on assigning a letter to each parts area. The area may be a cabinet, pegboard or an entire room. The rows and columns within the area are then numbered. Individual bins may be divided into 10 sections. The location is used when parts are received, sold or inventoried.

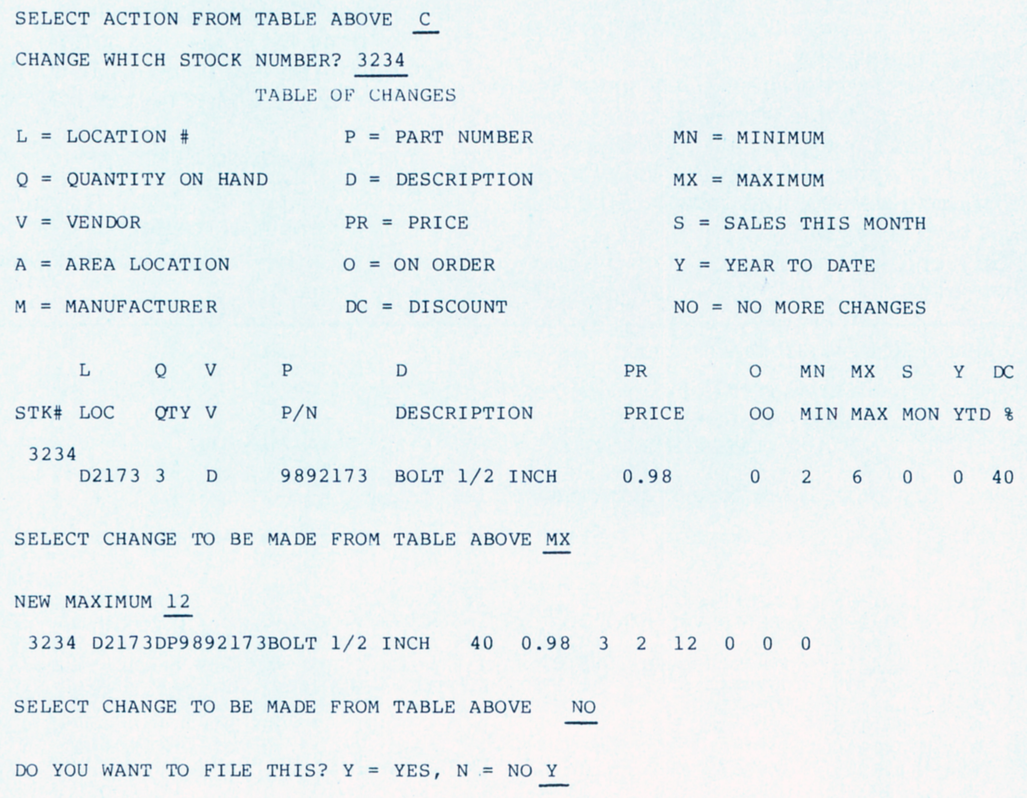
The minimum and maximum stock levels are established by your experience. The program keeps records of individual part sales by month and year, so it's easier to set the stock level. Have enough on hand so that a sale is not lost because you're out of stock, or money is not tied up from being overstocked.

The sort routine is used to sort the parts by location, so the time required to make a physical check of the in-



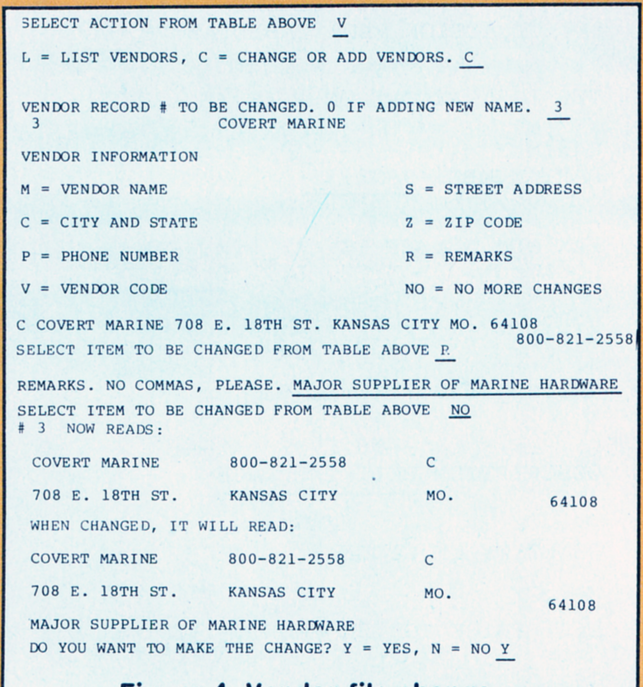
```
SELECT ACTION FROM TABLE ABOVE  A

THE LAST RECORD ON FILE IS  3233

MAXIMUM      ---7---
PART NUMBER 9892173

MAXIMUM NUMBER IS        X,--4-
LOCATION. EXAMPLE, B,25 D,2173

MINIMUM STOCK LEVEL 2

MAXIMUM STOCK LEVEL 6

            --15 LTRS MAX--
DESCRIPTION BOLT 1/2 INCH

QUANTITY IN STOCK 3

LIST PRICE TO THE PENNY. .98

VENDOR (SOURCE) CODE D

MANUFACTURER CODE P

DISCOUNT IN %. EXAMPLE, 50 FOR 50% 40

NOW PRINTING FILE AT I= 3234
```

Figure 2. Adding a new part number.



```
SELECT ACTION FROM TABLE ABOVE  C

CHANGE WHICH STOCK NUMBER? 3234
                      TABLE OF CHANGES

L = LOCATION #            P = PART NUMBER          MN = MINIMUM

Q = QUANTITY ON HAND      D = DESCRIPTION          MX = MAXIMUM

V = VENDOR                PR = PRICE               S = SALES THIS MONTH

A = AREA LOCATION         O = ON ORDER             Y = YEAR TO DATE

M = MANUFACTURER          DC = DISCOUNT            NO = NO MORE CHANGES

     L     Q   V    P        D                 PR        O   MN  MX  S   Y  DC

STK# LOC   QTY V    P/N      DESCRIPTION       PRICE     OO  MIN MAX MON YTD %

 3234
     D2173 3   D    9892173  BOLT 1/2 INCH     0.98      0   2   6   0   0  40

SELECT CHANGE TO BE MADE FROM TABLE ABOVE MX

NEW MAXIMUM 12

 3234 D2173DP9892173BOLT 1/2 INCH   40  0.98  3  2  12  0  0  0

SELECT CHANGE TO BE MADE FROM TABLE ABOVE  NO

DO YOU WANT TO FILE THIS? Y = YES, N = NO Y
```

Figure 3. Changing the data.



```
SELECT ACTION FROM TABLE ABOVE  V

L = LIST VENDORS, C = CHANGE OR ADD VENDORS. C


VENDOR RECORD # TO BE CHANGED. 0 IF ADDING NEW NAME.  3
 3                   COVERT MARINE

VENDOR INFORMATION

M = VENDOR NAME                          S = STREET ADDRESS

C = CITY AND STATE                       Z = ZIP CODE

P = PHONE NUMBER                         R = REMARKS

V = VENDOR CODE                          NO = NO MORE CHANGES

C COVERT MARINE 708 E. 18TH ST. KANSAS CITY MO. 64108
                                                 800-821-2558
SELECT ITEM TO BE CHANGED FROM TABLE ABOVE P

REMARKS. NO COMMAS, PLEASE. MAJOR SUPPLIER OF MARINE HARDWARE
SELECT ITEM TO BE CHANGED FROM TABLE ABOVE  NO
# 3  NOW READS:

 COVERT MARINE       800-821-2558        C

 708 E. 18TH ST.     KANSAS CITY         MO.
                                                   64108
 WHEN CHANGED, IT WILL READ:

 COVERT MARINE       800-821-2558        C

 708 E. 18TH ST.     KANSAS CITY         MO.
                                                   64108
 MAJOR SUPPLIER OF MARINE HARDWARE
 DO YOU WANT TO MAKE THE CHANGE? Y = YES, N = NO Y
```

Figure 4. Vendor file change.

ventory is cut drastically. One business reduced the time from over a week to less than a day—with far more accurate results.

The description is a 15-letter name for each part. Since the file may be sorted to give an alphabetical catalog listing, it is good to use the fundamental word first followed by a more specific description. For example,

TIRE,7.5 x 14,Blk
TIRE,7.5 x 14,Wht
TIRE,6 x 13,Blk

The sort routine will place all tires together for easy location on the alphabetical list.

The quantity in stock is entered next. It is suggested that all parts be entered first as it may require several days for each 1000 part numbers. Take inventory and enter the quantity for each part number. The program will be off and running with accurate data, and the total dollar value will be meaningful.

The list price is entered and printed out on the price reference sheet. The net is determined automatically from the product of the list price and the discount percentage.

The vendor code is used by the operations program to retrieve the name, address and phone number of the part source—and automatically produce a purchase order for that vendor.

The manufacturer code is recorded since some parts are available from more than one source.

The discount is entered as a number representing the percent margin you want to maintain for the part.

The display shows that the information for the part number is being recorded and the record number at which it is located.

The change option is used frequently to maintain the parts file (figure 3). It is possible to change any portion of the record very quickly without having to search through the entire file or each record. The data in each record is displayed below titles to make it easy to locate the portion to be changed. The record is also displayed after each change to allow the operator to monitor the entries. Finally, an option is given to file the new information or leave the record undisturbed.

Selecting the vendor option will bring up the choice of listing the vendors or changing (or adding to) the list of vendors. Vendors may be listed on the display or a printed output may be obtained.

Changing the information in the vendor file is done by selecting the vendor number and the information to be changed from the vendor information table (figure 4).

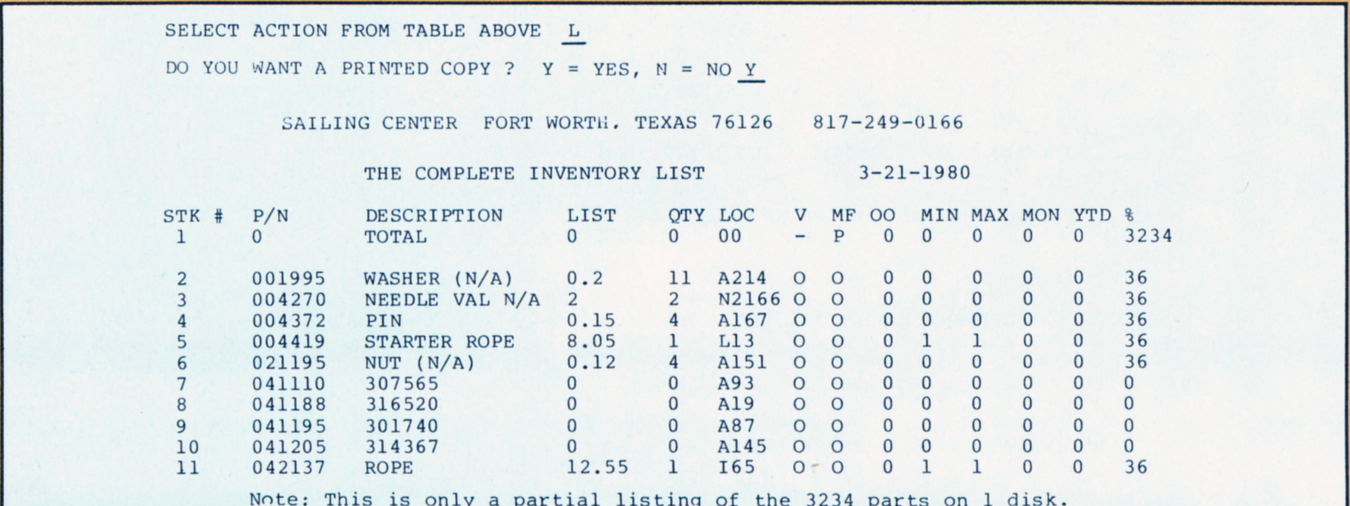
The information is shown as it is now and how it will read after the change is made. The operator is given the option to make the change or leave the record undisturbed.

The complete inventory list is useful to check the entire record for each part number after all are entered (figure 5). Remember, the first record is the counter to keep track of the total number of records in the file.

The price list is used as a reference in day-to-day operation. This may be shown to customers; it contains the retail price, where the part may be found, and how many are in stock.

The file may be sorted in three different ways before printing the price list:

- By part number in ascending or descending order
- By description in alphabetical order
- By location



```
SELECT ACTION FROM TABLE ABOVE  L

DO YOU WANT A PRINTED COPY ?  Y = YES, N = NO Y

      SAILING CENTER  FORT WORTH. TEXAS 76126   817-249-0166

             THE COMPLETE INVENTORY LIST          3-21-1980

STK #  P/N     DESCRIPTION     LIST     QTY LOC    V  MF OO  MIN MAX MON YTD %
 1     0       TOTAL           0        0   00     -  P   0   0   0   0   0   3234

 2     001995  WASHER (N/A)    0.2      11  A214   O  O   0   0   0   0   0   36
 3     004270  NEEDLE VAL N/A  2        2   N2166  O  O   0   0   0   0   0   36
 4     004372  PIN             0.15     4   A167   O  O   0   0   0   0   0   36
 5     004419  STARTER ROPE    8.05     1   L13    O  O   0   1   1   0   0   36
 6     021195  NUT (N/A)       0.12     4   A151   O  O   0   0   0   0   0   36
 7     041110  307565          0        0   A93    O  O   0   0   0   0   0   0
 8     041188  316520          0        0   A19    O  O   0   0   0   0   0   0
 9     041195  301740          0        0   A87    O  O   0   0   0   0   0   0
 10    041205  314367          0        0   A145   O  O   0   0   0   0   0   0
 11    042137  ROPE            12.55    1   I65    O  O   0   1   1   0   0   36
      Note: This is only a partial listing of the 3234 parts on 1 disk.
```

Figure 5. Practical inventory listing.

Continued on page 134

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BOB ALBRECHT
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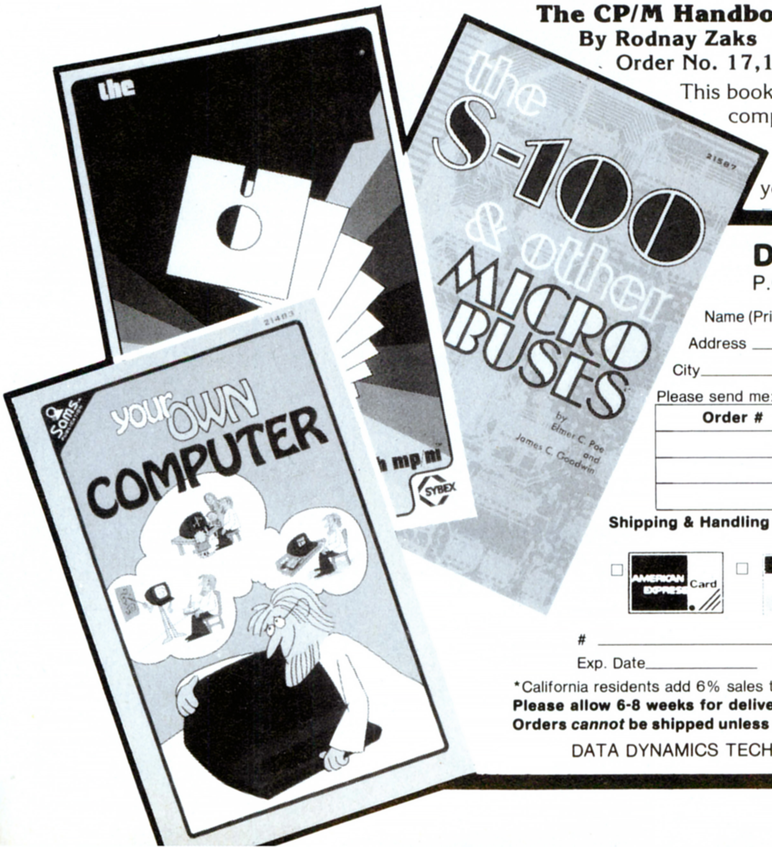
Describes one of the most exciting developments in the new home computer products, computer graphics. Computer graphics is the ability to create complex drawings, plan, maps, and schematics on the screen of a television set.


the
mp/m
SYBEX
the S-100 & other MICRO BUSES
21587
by Elmer C. Poe and James C. Goodwin
21403
Sams
your OWN COMPUTER

The CP/M Handbook with MP/M
By Rodnay Zaks
Order No. 17,105 321 pages $13.95

This book is intended to teach you how to use CP/M and its resources. No prior computer knowledge is needed. It is assumed that you have access to a computer system equipped with CP/M. Depending upon the application programs that you execute on a computer, will depend if you use all or part of the resources provided by CP/M.

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Salespeople, business writers, service technicians and executives all have one thing in common. Their jobs frequently call for a lot of travel. Frequency of travel varies with the job and individual, so figuring travel expenses can either be an occasional hassle or a dreaded task.

Whether record-keeping is done for the benefit of your boss, yourself, or Uncle Sam, many travelers arrive home from a long trip to find themselves with a briefcase full of receipts, a hastily-scribbled diary, and an hour of working with their pocket calculator ahead of them.

Travel Report is a disk-based expense report system written for the TRS-80 model I, but can be adapted to other computers as well as to cassette I/O. In this program, the computer prompts the entry of data about a current trip, and automatically calculates the total expenses.

Computing the profit

Salespeople, writers, or others who work on a "project" or "call" basis can compare the amount of income produced by the trip with the total expenses. Profitability of the trip, as well as average profit per project, are figured. Commissions, if applicable, can be subtracted from the gross to figure profits.

Frequently-used variables, such as per diem food allowances, mileage rates, and commission percentages, can be stored in a separate disk file, updated when desired, and used by the program in its calculations.

As a business writing organization, my company receives assignments from a number of clients, who pay us a fixed fee to conduct interviews and write articles for trade magazines. I'm paid a percentage of our fee—a sort of commission—and the rest goes toward expenses and company profits. Some other businesses providing very dissimilar services also use the same type of payment structure.

Five menu options are offered when the program is run. 1.) Enter expenses for a new trip. 2.) Save expense information to disk 3.) Print out expense report 4.) Change fixed rates 5.) Retrieve previous trip for access.

An error trap built into the menu subroutine keeps users from selecting some inappropriate options. For example, if data about a trip has not been entered yet ('dflag' has not been set to 1 in line 220), the program will not allow the user to attempt to save or print out trip data.

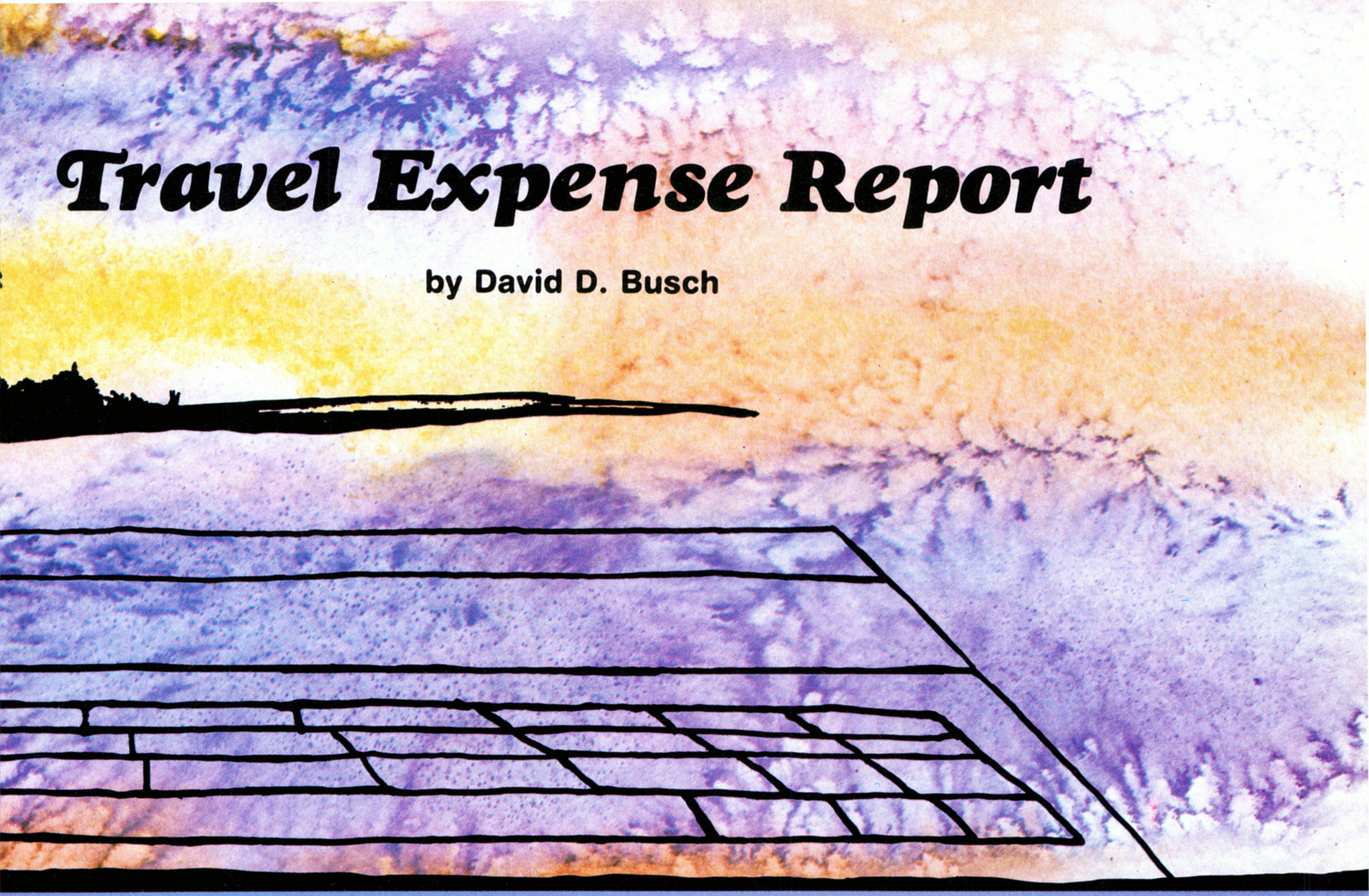
The program loads the values of three variables from a disk file, 'rates'. The variables PD, MA and PER correspond to the predetermined per diem paid for food (PD), cents-per-mile allowance (MA), and percent commission paid (PER). The values of these variables are stored in a disk file instead of within the program itself for a simple reason. It makes it possible to write the program so that even nonprogrammer users are able to change the "fixed" rates that do, in fact, change from employee to employee and from time to time.

Though only three variables are used as changable rates, those adapting Travel Report for their own businesses can expand this function easily. Instead of calling the rate file 'rates', different names can be assigned to correspond with different employees who might be working for different commissions.

Once 'rates' has been loaded, the traveler inputs his/her name into the string variable NME$, and enters departure and return days for the trip. The program accesses a subroutine at lines 2340-2410, which calculates the day-of-the-year numeric value for the

Travel Expense Report

by David D. Busch



user-provided DD/MM date. By subtracting the departure day (LD) from return day (RD) in line 450, the number of days gone (DG) can be determined and used to either calculate the food allowance, if a per diem is paid (line 460), or to prompt the traveler to enter reimbursable food expenses for each day traveled.

The next portion of the expense input calculates transportation expenses, whether the traveler has flown, driven a personal car, or company car. If travel was by air, airfare and car rental cost are input. Car rentals that are not billed directly to the company, and which were paid for by the employee for reimbursement, are taken into account. Cost of taxis, limos, and other ground transportation used by air travelers is also input in this section.

Those using their own cars are asked for the number of miles driven, while employees using rental or company cars are prompted to enter reimbursable gasoline purchases, repairs, and other transportation expenses.

Parking, tolls, hotel costs, and miscellaneous expenses may be entered by all travelers to complete the input of expenses. Companies like mine, working on a project, sales call, or assignment basis will use the next section, beginning with line 1190, to input number of projects or calls, and billing for each. Employee commission is figured in line 1240, and the total spent for travel expenses is added up in line 1250.

The Travel Report is printed out in lines 1280-1830. Total expenses, reimbursement due, and profit per project are displayed along with the individual figures and total sales. By this time, 'dflag' has been set to 1 (in line 1260). The user is able to direct the program to print out the report, or to return to the menu.

From the menu, the employee has the option of saving the travel data to disk or, again, to print out the report. Printing is accomplished merely by poking the printer driver address into memory in place of the video driver address in a subroutine at lines 1890-1920. The information previously printed to the CRT screen is directed to the printer. Normal video operation is restored after the report is printed in lines 1930-1970.

If the employee wishes to save the trip data to disk, the program automatically makes up a file name stored in string variable F$. The file name is put together from the value of the month and day the trip commenced prefaced by the letter 'D', because the Radio Shack disk Basic will not allow file names beginning with a number. For example, a trip beginning December 12 would be assigned the file name D1212.

The relevant data about the trip is stored in the disk file, which can be retrieved for printout at any later time. To access a trip's data, the user enters the date of the beginning of the trip in MM/DD format. The program parses the date and reassembles the correct file name to load the data.

Some changes will be necessary to Travel Report for those with other than Radio Shack disk systems. Probably the easiest changes will be for those using Radio Shack cassette systems. Because the data saved is not especially lengthy, cassette data files ('print #-1', 'Input #-1', etc.) will be fairly convenient to use both for the 'rates', and trip data. The file naming routines, and buffer opening and closing functions can be deleted.

Those with other disk systems will find that no unusual Basic features have been used in Travel Report other than the 'pokes'. A printer flag can be used to determine if a line that is 'printed' to the screen should also be 'lprinted' (i.e., 'if pflag = 1 then lprint'...).☐

Program on page 138

Micro Systems Survey:

Let The
Buyer Compare
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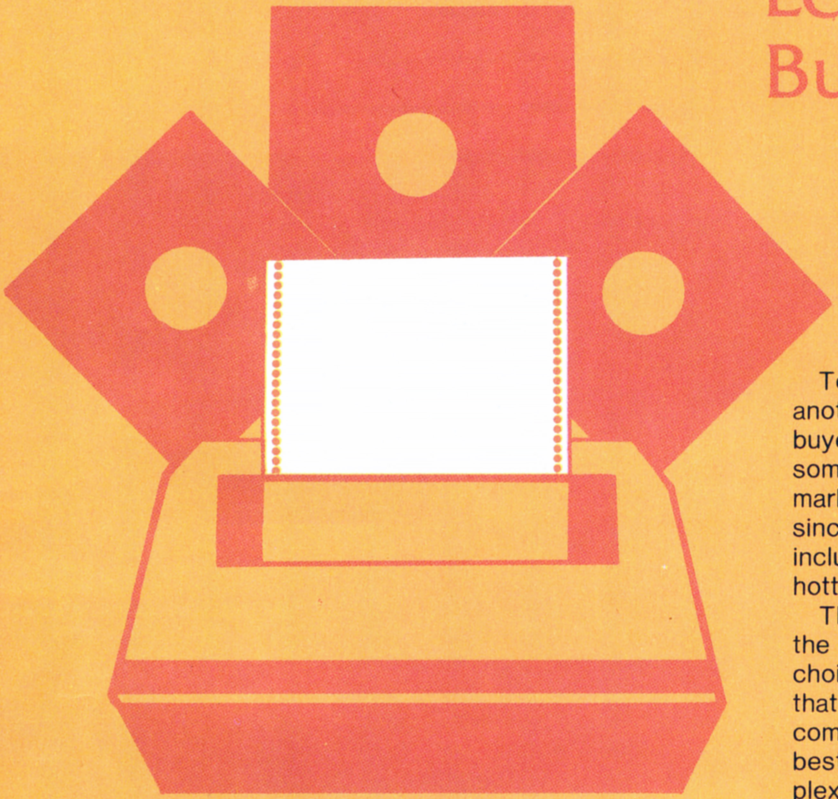


Let The Buyer Compare

by Tom Fox

To appropriately usher in the '80s, IA has undertaken another of its extensive microcomputer surveys to give buyers, hobbiests—and even rival manufacturers—some guide as to what is currently available in the market. Our charts have more than tripled in content since the ones published a mere six months ago, and includes some 34 manufacturers detailing 60 of their hottest systems.

This broadening of the field is a positive reflection of the glowing health of the industry, and the countless choices open to the buyer. It's a good situation: one that puts the purchaser in the driver's seat when it comes to buying a system. Conversely, choosing the best machine is harder than ever. Choices are complex; computer sales personnel more insistent. More and more the burden is on the buyer to learn about these complex systems before making the wisest choice. That's what this survey of the current market hopes to help him do.

The five tables compare the various capabilities of the systems under investigation. Most of the information is self-explanatory, but some of the categories can be a little tricky, due to the tabular headings, which do a good job of describing one manufacturer's system, but are often inadequate to describe someone else's. Each system has unique properties not shared by any of the others, so the attempt to force-fit meaningful descriptions in to generalized column headings only short-changes one—or all—suppliers.

Table 1 carries general information about hardware. Most importantly, it lists a model's number, major components and price. In this and the following tables, the indication "Std" means the hardware or software item is included as standard equipment. "Opt" indicates the item is optional at extra cost.

Under "enclosure," we indicate if the computer is supplied in a free-standing tabletop housing, is integrated into a desk-style work station, is equipped for rack mounting or a combination of these. The "bus" column tells us if the plug-in cards that make up the computer conform to a known industry standard. As expected, the S-100 bus is the most popular one, although there is a strong trend toward single-board computers and proprietary bus designs.

You can, in theory, interchange different manufacturers' circuit boards if they both conform to the same bus protocol. In the case of the S-100 bus, the manufacturers have banded together to pin down the electrical specifications via the IEEE, an industry trade association. We've indicated those manufacturers which have subscribed to these standards.

Finally, table 1 indicates whether or not a cathode-ray tube (CRT) display terminal or hard copy printer is included in the base price. Several manufacturers do not provide these devices at all; local dealers buy them separately and integrate them into a system before delivery to the customer. Note: these peripheral devices can significantly increase the purchase price; take that into account when comparing system costs.

Table 2 takes a closer look at the data storage areas of the computers. There are two classes: RAM and disk storage. RAM stands for random access memory, the fast semiconductor memory element utilized by all of the systems under review. The amounts are shown in kilobytes (or thousands of bytes). A byte is equivalent to the amount of storage required to remember a single character, such as "A".

All of the systems are equipped with one or more disk drives, either the flexible diskette (floppy) variety, or the higher-performance hard disk drive. Some systems come with both; the floppy disk drive is included to create backup copies of data on Winchester-technology hard disk drives. Other than the obvious advantage of having more storage space, hard disk drives are several times faster than the floppies. Capacities are shown in kilobytes or megabytes (millions of bytes). All floppy disk drives are removable and can be stored for safekeeping or to maintain a library of programs, data, etc. It's of critical importance that at least one extra copy (backup) of each important diskette be maintained. There are several kinds of human and machine errors that can cause the data on a diskette to be destroyed with alarming ease. Creating the backup copy requires at least two diskette drives fitted to the computer: the master being copied and the "scratch" disk receiving the data. Systems with single drives do not adapt to this feature.

The same principles, of course, apply to hard disk drives—only the amount of data that can accidentally be destroyed is much greater. Hard disks listed as the "cartridge" type in table 2 contain a certain amount (usually half) of their storage on an internal, nonremovable disk platter. The cartridge itself is a removable disk that can be inserted into the drive to back up the data contained on the nonremovable one.

Backup copies of critical data are nearly as easy to make as for floppy disk systems. Winchester-technology hard disks are fundamentally different: all data is on a nonremovable disk platter. Winchester devices contain a spinning disk within a hermetically sealed environment. Data copies must be made on some other external device, often a floppy disk; in others, a special magnetic tape cassette. The Winchester technology offers today's best bargain in bytes-per-buck storage, but the world is still waiting for someone to solve the knotty problem of backing up data in a more convenient, economical manner. Many simply skip the backup process—an invitation to disaster, in our opinion.

Table 3, systems software, shows programs normally provided by the manufacturer to manage the central function of moving data among the computer memory, disk, printer, and terminal(s). It includes software that can be utilized by programming personnel to create usable application programs (listed on the next chart).

If having a large library of purchasable programs is important in your business, pick a system that can run with one of the widely used operating systems. CP/M leads the pack; but several others also enjoy wide use.

Column headings are included for the four most popular programming languages (Basic, Cobol, Fortran and Pascal) as well as the assembler that can produce runnable programs in the native language of the microprocessor itself.

Table 4 lists the major applications packages available from the various manufacturers. The "big five" are there (general ledger, accounts payable, accounts receivable, payroll and order entry/inventory control), as are a pair of applications that are becoming featured by more and more computers these days; word processing and data base management.

First time computer users, who have never uttered the acronym DBMS, find it soon becomes the most-used program in the machine. Applied intelligently, a good DBMS can organize everything from the annual report to your daily appointment calendar. There is little standardization in DBMS programs, so make sure the one you purchase is appropriate to the size and complexity of your needs.

Table 5 looks at the companies that make the computer systems under review—their size, age, and retail outlet base, as well as the manufacturing history of the system itself. "Gross sales" are for the most recent complete business year and include the receipts of any parent company.

Also shown is the current number of retail outlets and service centers, if different. These quantities, incidentally, are changing rapidly—mostly upward. We've also indicated those manufacturers who have agreed to repair their product in your office—instead of making you lug a dead box into their service center. In most cases, the manufacturers depend on local retail outlets for on-site service. It's a good idea to know the capabilities of your nearest computer store.

The last two columns note the date the firm began operations and the approximate number of systems delivered at the time of survey.☐

Tom Fox can be reached at 17925-G Sky Park Circle, Irvine, CA 92714, (714) 957-9332.

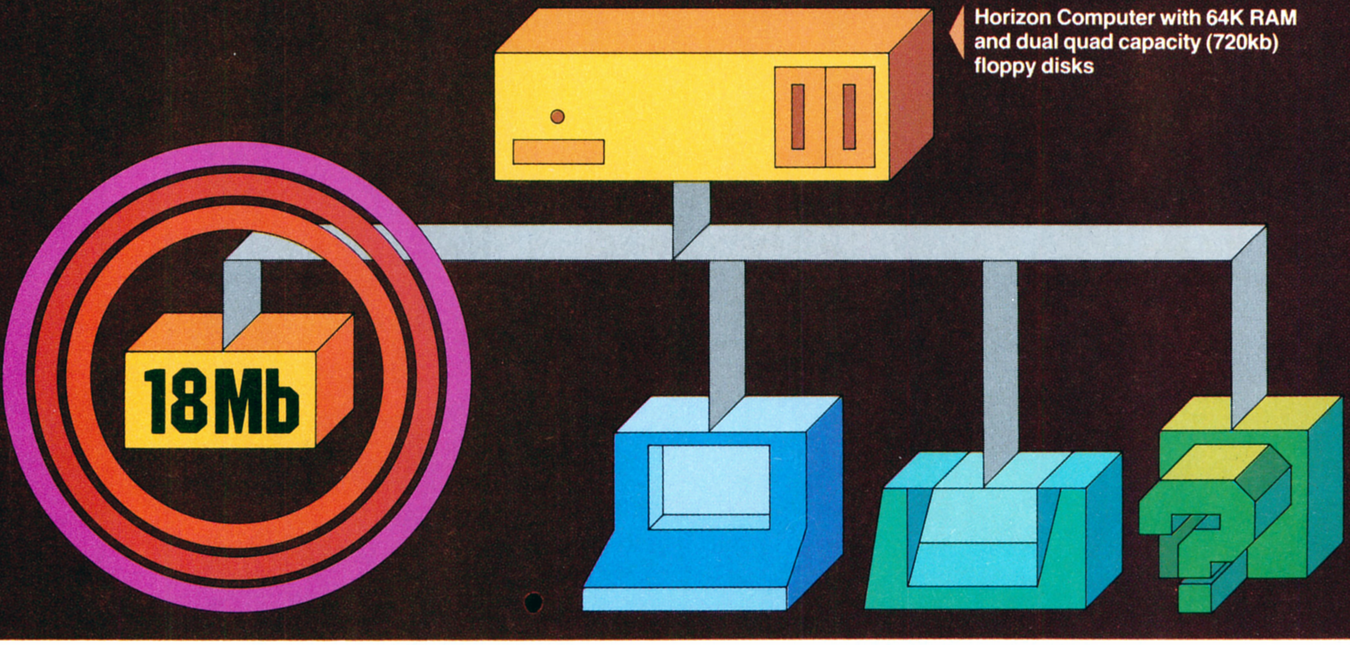
Tables to follow

Table 1. Hardware Data

MANUFACTURER	SYSTEM	PRICE	ENCLOSURE			CPU		BUS	STD. PERIPHERALS	
			TABLETOP	DESK	RACK	TYPE	BITS		TERMINAL	PRINTER
ACI	ACI-90	$5,695	Yes	No	No	Micro-engine	16	None	No	No
ADC	Series 80	$10,500	Std	Opt	No	8080A	8	None	No	No
ADC	Event 2000	$14,790	Opt	Std	No	8080A	8	None	Yes	Yes
ADDS	Multivision 1	$ 3,785	Std	No	No	8085A	8	Prop	No	No
ADDS	Multivision 3	$12,225	Std	No	No	8085A	8	Prop	No	No
Alpha Micro	AM-1030	$16,175	Std	No	Opt	WD16	16	S-100*	No	No
ALTOS	ACS-8000-5	$ 5,990	Opt	Opt	Std	Z80A	8	None	No	No
ALTOS	ACS-8000-6	$ 9,450	Opt	Opt	Std	Z80A	8	None	No	No
Billings	BC12FD	$ 5,700	Std	No	No	Z80	8	None	Yes	No
Billings	BC12DF2M	$ 9,000	Std	No	No	Z80	8	None	Yes	No
BRD	Dolphin	$15,000	No	Std	No	6800	8	Motorola	Yes	Yes
CADO	CAT	$13,990	Std	No	No	8085A	8	Prop	Yes	Yes
CADO	20/24	$20,605	No	Std	No	8085A	8	Prop	Yes (2)	Yes
Codata	CTS-100	$ 8,550	Std	No	No	8080 8085	8 8	Multibus	Yes	No
Codata	CTS-100/6	$11,500	Std	No	No	8080 8085	8 8	Multibus	Yes	No
COMPAL	8200/WS	$ 8,995	No	Std	No	Z80	8	S-100*	Yes	No
COMPAL	8200/T	$12,500	No	Std	No	Z80	8	S-100*	Yes	Yes
Computhink	MINIMAX 1	$ 7,700	Std	No	No	6502	8	None	Yes	Yes
Computhink	MINIMAX 2	$ 9,200	Std	No	No	6502	8	None	Yes	Yes
Cromemco	System 3	$ 7,395	No	Opt	Std	Z80	8	S-100	No	No
Cromemco	Z-2H	$ 9,995	No	Opt	Std	Z80	8	S-100	No	No
Datapoint	1500	$ 7,075	Std	No	No	Z80	8	Prop	Yes	No
DMS	DSC-4	$ 6,950	Std	No	No	Z80A	8	Multibus	No	No
DMS	HEX-29	$13,445	Std	No	No	2900	16	Prop	No	No
Durango	Colt	$ 9,950	Std	No	No	8085	8	Prop	Yes	Yes
Durango	F-85/710	$11,975	Std	No	No	8085	8	Prop	Yes	Yes
Dynabyte	5200	$ 4,895	Std	Opt	Opt	Z80A	8	S-100	No	No
Dynabyte	5600	$12,595	Std	Opt	Opt	Z80A	8	S-100	No	No
Heath	WH89-CA	$ 2,895	Std	Opt	No	Z80	8	None	Yes	No
IBC	System 40	$ 7,500	No	Opt	Std	Z80	8	None	No	No
IBC	System 40M	$15,025	No	Opt	Std	Z80	8	None	No	No
IBM	5120	$13,375	Std	No	No	Prop	N/A	Prop	Yes	Yes
IMS	Series 5000	$ 3,400	Std	Opt	No	Z80	8	S-100	No	No
IMS	Series 8000	$ 4,950	Std	Opt	No	Z80	8	S-100	No	No
MicroDaSys	Dual Millie	$ 6,995	Std	No	No	Z80A	8	S-100*	Yes	No
Ohio Scientific	C3-B	$ 7,995	Std	Opt	No	Z80 6800 6502	8 8 8	Prop	No	No
Ohio Scientific	C3-D	$13,995	Std	Opt	No	Z80 6800 6502	8 8 8	Prop	No	No
ONYX	C8001	$11,000	Std	Opt	Opt	Z80	8	None	No	No
ONYX	C8002	$18,500	Std	Opt	Opt	Z8000	16	None	No	No
Pertec	PCC2000	$ 9,995	Std	No	No	8085	8	P-100	Yes	No
PPS	SYST2VX	$ 7,205	Yes	No	No	LSI-11	16	DEC	No	No
PPS	SYST1VC	$13,995	No	No	Yes	LSI-11	16	DEC	No	No
Radio Shack	TRS-80 Model III	$ 2,495	Std	Opt	No	Z80	8	Prop	Yes	No
Radio Shack	TRS-80 Model II	$ 3,899	Std	Opt	No	Z80	8	Prop	Yes	No
SDS	420	$ 8,400	Std	Opt	No	6502A	8	Prop	Yes	No
SDS	432	$18,900	Std	Opt	No	6502A	8	Prop	Yes	No
SEE	6684	$ 4,995	Std	Opt	No	6512A	8	Prop	No	No
SEE	6789	$ 8,995	Std	Opt	No	6512A	8	Prop	Yes	No
Smoke Signal	9822	$ 7,320	Std	Opt	Opt	6809	8	SS-50	Yes	Yes
Smoke Signal	H9822	$13,090	Std	Opt	Opt	6809	8	SS-50	Yes	Yes
Technico	SS16	$ 8,995	Std	Opt	Opt	TMS9900	16	Prop	No	No
Technico	TI32	$17,500	Opt	Std	Opt	TMS9900	16	Prop	No	No
TI	DS990/1	$ 9,995	Std	No	No	TMS9900	16	Prop	Yes	No
Vector Graphics	VIP	$ 3,695	Std	Opt	No	Z80A	8	S-100	Yes	No
Vector Graphics	System B	$ 5,463	Std	Opt	No	Z80A	8	S-100	Yes	No
Xerox	Diablo 3000	$13,900	Std	No	No	8085	8	Prop	Yes	Yes
Xerox	Diablo 3200	$26,000	No	Std	No	8085	8	Prop	Yes	Yes
Zilog	MCZ 1/50	$ 8,460	Std	No	No	Z80A	8	Z-BUS	Yes	No
Zilog	MCZ 1/70	$18,240	No	No	Std	Z80A	8	Z-BUS	Yes	No

*Conforms to new IEEE standards.

New on the North Star Horizon:
18Mb Hard Disk Drive!



Horizon Computer with 64K RAM and dual quad capacity (720kb) floppy disks

Up to four 18Mb Winchester-type hard disk drives

Display terminal

Letter-quality or dot matrix printer

Horizon I/O flexibility allows expansion to meet your needs

Unsurpassed Performance and Capacity!

North Star now gives you hard disk capacity and processing performance never before possible at such a low price! Horizon is a proven, reliable, affordable computer system with unique hardware and software. Now the Horizon's capabilities are expanded to meet your growing system requirements. In addition to hard disk performance, the Horizon has I/O versatility and an optional hardware floating point board for high-performance number crunching. The North Star large disk is a Century Data Marksman, a Winchester-type drive that holds 18 million bytes of formatted data. The North Star controller interfaces the drive(s) to the Horizon and takes full advantage of the high-performance characteristics of the drive. Our hard disk operating system implements a powerful file system as well as backup and recovery on floppy diskette.

Software Is The Key!

The Horizon's success to date has been built on the quality of its system software (BASIC, DOS, PASCAL) and the very broad range and availability of application software. This reputation continues with our new hard disk system. Existing software is upward compatible for use with the hard disk system. And, with the dramatic increase in on-line storage and speed, there will be a continually expanding library of readily available application software. For more information, see your North Star dealer!

HORIZON-HD-18
Horizon computer with 64K RAM, 2 quad capacity mini drives and one HDS-18 hard disk drive **$9329**

HDS-18
Additional 18Mb hard disk drive for expansion of Horizon HD-18, or your present Horizon **$4999**

SYS-1N
Complete Horizon HD-18 plus 80 x 24 display terminal and NEC Spinwriter printer **$13,239**

SYS-1A
Complete Horizon HD-18 with 80 x 24 display terminal and Anadex printer **$11,319**

NorthStar

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A New Medical Billing System That is Easy, and Works!

FILL IN THE BLANKS

The only system that works like you do. Add, change, or delete material right on the form (displayed on the video screen). It's really easier than filling in the blank because you can go back and type over any mistake you make.

NO BATCHING

As the information is entered, the system automatically detects clerical errors in patient information, procedure codes, and procedural data. No waiting days or weeks for verification.

INSTANT ACCESS

Up to date patient information available anytime. Patient files are updated everytime a transaction is entered. All you need to check their files is to enter the patient's name — no ID number.

PRIVATE AND THIRD PARTY BILLING

System keeps track of third party billing and insurance claims. You can bill the patient on paper while they are in the office! Resubmission of a claim is as simple as pushing a button.

TECHNICAL SPECIFICATIONS

Written in Pascal, the system runs on most any 56K or 64K micro or mini computer. The system is currently operating on Dynabyte, Cromemco, Onyx, Vector Graphic, and Digital Equipment Corporation (DEC) computers. Different systems provide 500 to 10,000+ patient capacity.

Contact your Local computer store or

PBS
PROFESSIONAL
BUSINESS
SOFTWARE

CIRCLE INQUIRY NO. 53

119 Fremont Street, San Francisco, CA 94105, (415) 546-1596

Table 2. Memory/Storage Data

MANUFACTURER	SYSTEM	RAM		DISK DRIVE (Standard Configuration)			
		STD	MAX	FLOPPY	WINCHESTER	CARTRIDGE	CASSETTE TAPE
ACI	ACI-90	64K	128K	512KB	—	—	—
ADC	Series 80	64K	64K	—	14MB	—	—
ADC	Event 2000	64K	64K	1.2MB	—	—	—
ADDS	Multivision 1	64K	64K	700KB	—	—	—
ADDS	Multivision 3	128K	256K	700KB	5MB	—	—
Alpha Micro	AM-1030	64K	1024K	—	—	10MB	—
ALTOS	ACS-8000-5	64K	208K	1MB	—	—	—
ALTOS	ACS-8000-6	64K	208K	1MB	14MB	—	—
Billings	BC12FD	64K	64K	630KB	—	—	—
Billings	BC12DF2M	64K	64K	2002KB	—	—	—
BRD	Dolphin	8K	32K	1.2MB	—	—	—
CADO	CAT	32K	32K	1.2MB	—	—	—
CADO	20/24	32K	48K	2.4MB	—	—	—
Codata	CTS-100	64K	64K	696KB	—	—	—
Codata	CTS-100/6	64K	64K	348KB	6MB	—	—
COMPAL	8200/WS	56K	56K	630KB	—	—	—
COMPAL	8200/T	56K	56K	630KB	—	—	—
Computhink	MINIMAX 1	108K	108K	400KB	—	—	—
Computhink	MINIMAX 2	108K	108K	800KB	—	—	—
Cromemco	System 3	64K	512K	1.2MB	—	—	—
Cromemco	Z-2H	64K	512K	78KB	11MB	—	—
Datapoint	1500	32K	60K	500KB	—	—	—
DMS	DSC-4	128K	512K	1MB	—	—	—
DMS	HEX-29	94K	1000K	1MB	—	—	—
Durango	Colt	64K	64K	1MB	—	—	—
Durango	F-85/710	64K	64K	1MB	—	—	—
Dynabyte	5200	48K	400K	630KB	—	—	—
Dynabyte	5600	64K	400K	1MB	9MB	—	—
Heath	WH89-CA	48K	64K	100KB	—	—	—
IBC	System 40	64K	128K	2MB	—	—	—
IBC	System 40M	128K	128K	2MB	17MB	—	—
IBM	5120	32K	64K	2.4MB	—	—	—
IMS	Series 5000	64K	512K	600KB	—	—	—
IMS	Series 8000	64K	512K	2MB	—	—	—
MicroDaSys	Dual Millie	64K	64K	1MB	—	—	—
Ohio Scientific	C3-B	52K	52K	272KB	74M	—	—
Ohio Scientific	C3-D	52K	52K	544KB	74M	—	—
ONYX	C8001	64K	64K	—	10MB	—	12MB
ONYX	C8002	256K	1000K	—	10MB	—	12MB
Pertec	PCC2000	64K	320K	1200KB	—	—	—
PPS	SYST2VX	64K	64K	1MB	—	—	—
PPS	SYST1VC	64K	64K	—	—	10MB	—
Radio Shack	TRS-80 Model III	32K	48K	350KB	—	—	—
Radio Shack	TRS-80 Model II	64K	64K	486KB	—	—	—
SDS	420	32K	56K	1.25MB	—	—	—
SDS	432	56K	56K	1.25MB	31MB	—	—
SEE	6684	48K	12000K	1MB	—	—	—
SEE	6789	48K	12000K	600KB	10MB	—	—
Smoke Signal	9822	64K	256K	2MB	—	—	—
Smoke Signal	H9822	64K	256K	1MB	30MB	—	—
Technico	SS16	64K	96K	1024KB	—	—	—
Technico	TI32	96K	256K	—	10.7MB	—	10MB
TI	DS990/1	64K	64K	1.2MB	—	—	—
Vector Graphics	VIP	56K	56K	315KB	—	—	—
Vector Graphics	System B	56K	224K	630KB	—	—	—
Xerox	Diablo 3000	32K	64K	1.25MB	—	—	—
Xerox	Diablo 3200	32K	64K	600KB	10MB	—	—
Zilog	MCZ 1/50	64K	64K	600KB	—	—	—
Zilog	MCZ 1/70	64K	64K	—	—	10MB	—

Table 3. Systems Software Data

MANUFACTURER	SYSTEM	OPERATING SYSTEM		PROGRAMMING LANGUAGES					
		Single User	Multi User	Assembler	Basic	Cobol	Fortran	Pascal	Others
ACI	ACI-90	UCSD	None	No	No	No	No	Std	None
ADC	Series 80	None	Microdos	No	Std	No	No	No	None
ADC	Event 2000	Microdos	None	No	Std	No	No	No	None
ADDS	Multivision 1	MUON	None	Opt	Opt	No	No	No	None
ADDS	Multivision 3	None	MUON	Opt	Opt	No	No	No	None
Alpha Micro	AM-1030	None	AMOS	Std	Std	No	No	Std	LISP (Std) ISAM (Std) SORT (Std)
ALTOS	ACS-8000-5	CP/M	MP/M	Std	Opt	Opt	Opt	Opt	OASIS
ALTOS	ACS-8000-6	CP/M	MP/M	Std	Opt	Opt	Opt	Opt	OASIS
Billings	BC12FD	Std	None	Opt	Opt	Opt	Opt	No	None
Billings	BC12DF2M	Std	None	Opt	Opt	Opt	Opt	No	None
BRD	Dolphin	Std	None	Std	Std	No	No	No	None
CADO	CAT	Std	None	No	No	No	No	No	CADOL
CADO	20/24	None	Std	No	No	No	No	No	CADOL
Codata	CTS-100	CP/M	Opt	Opt	Opt	Opt	Opt	Opt	None
Codata	CTS-100/6	CP/M	Opt	Opt	Opt	Opt	Opt	Opt	None
COMPAL	8200/WS	MDOS	None	Std	Std	Opt	Opt	Opt	CP/M
COMPAL	8200/T	MDOS	None	Std	Std	Opt	Opt	Opt	CP/M
Computhink	MINIMAX 1	MDOS	None	Std	Std	No	No	No	FIFTH
Computhink	MINIMAX 2	MDOS II	None	Std	Std	No	Opt	No	FORTH, FIFTH PL/MX
Cromemco	System 3	Opt	Opt	Opt	Opt	Opt	Opt	No	LISP, RPG II RATFOR
Cromemco	Z-2H	Opt	Opt	Opt	Opt	Opt	Opt	Opt	LISP, RPG II RATFOR
Datapoint	1500	Std	Opt	No	Std	No	No	No	Databus
DMS	DSC-4	CP/M	Opt	Opt	Opt	Opt	Opt	Opt	OASIS, PL/1
DMS	HEX-29	None	HOST	Std	Std	No	Opt	Opt	None
Durango	Colt	Opt	None	Opt	Opt	Opt	Opt	Opt	CP/M, PL/M
Durango	F-85/710	Opt	Opt	Opt	Opt	Opt	Opt	Opt	CP/M, PL/M
Dynabyte	5200	DDOS2	Opt	Std	Opt	Opt	Opt	Opt	Super Sort
Dynabyte	5600	DDOS2	Opt	Std	Opt	Opt	Opt	Opt	Super Sort
Heath	WH89-CA	Opt	None	Opt	Opt	Opt	Opt	Opt	C, CP/M CBASIC 2
IBC	System 40	None	FAMOS	Std	Std	Opt	No	Opt	OASIS
IBC	System 40M	None	FAMOS	Std	Std	Opt	No	Opt	OASIS
IBM	5120	Std	None	No	Std	No	No	No	APL, Sort Communications
IMS	Series 5000	CP/M	Opt	Opt	Opt	Opt	Opt	Opt	None
IMS	Series 8000	CP/M	Opt	Opt	Opt	Opt	Opt	Opt	None
MicroDaSys	Dual Millie	Std	None	Std	Std	Opt	Opt	Opt	APL
Ohio Scientific	C3-B	Opt	None	Std	Std	Std	Std	Opt	None
Ohio Scientific	C3-D	Std	None	Std	Std	Std	Std	Opt	None
ONYX	C8001	MP/M	MP/M	Opt	Opt	Opt	Opt	Opt	MOASIS
ONYX	C8002	None	UNIX	Opt	Opt	Opt	Opt	Opt	C
Pertec	PCC2000	Std	MTX	Opt	Std	Opt	Opt	No	CP/M
PPS	SYST2VX	Opt	Opt	Opt	Opt	Opt	Opt	No	DIBOL
PPS	SYST1VC	Opt	Opt	Opt	Opt	Opt	Opt	No	DIBOL
Radio Shack	TRS-80 Model III	TRSDOS	None	No	Std	No	No	No	Communications (Std)
Radio Shack	TRS-80 Model II	TRSDOS	None	Opt	Std	Opt	Opt	No	None
SDS	420	Std	None	Std	Std	No	No	No	None
SDS	432	Std	None	Std	Std	No	No	No	None
SEE	6684	Std	Std	Std	Std	Opt	Opt	Opt	LISP, RPG II
SEE	6789	Std	Std	Std	Std	Opt	Opt	Opt	LISP, RPG II
Smoke Signal	9822	DOS69	Opt	Opt	Opt	Opt	Opt	Opt	FORTH
Smoke Signal	H9822	DOS69	OS-9	Opt	Opt	Opt	Opt	Opt	FORTH
Technico	SS16	None	Std	Opt	Opt	No	Opt	No	None
Technico	TI32	None	Std	Opt	Opt	No	No	No	None
TI	DS990/1	Opt	None	No	Opt	Opt	No	No	TPL
Vector Graphics	VIP	CP/M	None	Std	Std	Opt	Opt	Opt	APL
Vector Graphics	System B	CP/M	None	Std	Std	Opt	Opt	Opt	APL
Xerox	Diablo 3000	None	Std	Std	No	No	No	No	DACL
Xerox	Diablo 3200	None	Std	Std	No	No	No	No	DACL
Zilog	MCZ 1/50	Std	None	Std	Opt	Std	Opt	Opt	PL/Z
Zilog	MCZ 1/70	Std	Opt	Std	Opt	Std	Opt	Opt	PL/Z

Table 4. Applications Software Data

MANUFACTURER	SYSTEM	Word Processing	DBMS	General Ledger	Accounts Payable	Accounts Receivable	Payroll	Inventory Control	Others
ACI	ACI-90	No	No	No	No	No	No	No	None
ADC	Series 80	No	No	No	No	No	No	No	None
ADC	Event 2000	No	No	Opt	Opt	Opt	Opt	No	None
ADDS	Multivision 1	Std	No	No	No	No	No	No	None
ADDS	Multivision 3	Std	No	No	No	No	No	No	None
Alpha Micro	AM-1030	Std	No	Opt	Opt	Opt	Opt	Opt	None
ALTOS	ACS-8000-5	No	No	No	No	No	No	No	None
ALTOS	ACS-8000-6	No	No	No	No	No	No	No	None
Billings	BC12FD	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Legal, Personnel, Office
Billings	BC12DF2M	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Legal, Personnel, Office
BRD	Dolphin	Opt	No	Opt	Opt	Opt	Opt	Opt	Utility Billing
CADO	CAT	Std	Std	Std	Std	Std	Std	Std	None
CADO	20/24	Std	Std	No	No	No	No	No	None
Codata	CTS-100	Opt	No	No	No	No	No	No	None
Codata	CTS-100/6	Opt	No	No	No	No	No	No	None
COMPAL	8200/WS	Std	Opt	Opt	Opt	Opt	Opt	Opt	Property Analysis Communications Mail List
COMPAL	8200/T	Std	Opt	Opt	Opt	Opt	Opt	Opt	Property Analysis Communications Mail List
Computhink	MINIMAX 1	Std	No	Std	Std	Std	Std	No	Data Management (Std)
Computhink	MINIMAX 2	Std	No	Std	Std	Std	Std	No	Data Management (Std)
Cromemco	System 3	Opt	Opt	Opt	Opt	Opt	Opt	Opt	None
Cromemco	Z-2H	Opt	Opt	Opt	Opt	Opt	Opt	Opt	None
Datapoint	1500	Std	No	No	No	No	No	No	None
DMS	DSC-4	No	No	No	No	No	No	No	None
DMS	HEX-29	No	No	No	No	No	No	No	None
Durango	Colt	Opt	No	Opt	Opt	Opt	Opt	Opt	None
Durango	F-85/710	Opt	No	Opt	Opt	Opt	Opt	Opt	nsurance Agency Mgmt
Dynabyte	5200	Opt	No	Opt	Opt	Opt	No	Opt	Mail Merge
Dynabyte	5600	Opt	No	Opt	Opt	Opt	No	Opt	Mail Merge
Heath	WH89-CA	Opt	No	Opt	No	No	No	No	None
IBC	System 40	Opt	No	No	No	No	No	No	None
IBC	System 40M	Opt	No	No	No	No	No	No	None
IBM	5120	No	Opt	Opt	Opt	Opt	Opt	Opt	None
IMS	Series 5000	Opt	Opt	Opt	Opt	Opt	Opt	Opt	None
IMS	Series 8000	Opt	Opt	Opt	Opt	Opt	Opt	Opt	None
MicroDaSys	Dual Millie	Opt	Std	Std	Std	Std	Std	Std	Medical/Dental Billing
Ohio Scientific	C3-B	Opt	Opt	Opt	Opt	Opt	Opt	Opt	None
Ohio Scientific	C3-D	Opt	Opt	Opt	Opt	Opt	Opt	Opt	None
ONYX	C8001	No	No	No	No	No	No	No	None
ONYX	C8002	No	No	No	No	No	No	No	None
Pertec	PCC2000	Opt	No	Opt	Opt	Opt	Opt	Opt	None
PPS	SYST2VX	Opt	No	No	No	No	No	No	None
PPS	SYST1VC	Opt	No	No	No	No	No	No	None
Radio Shack	TRS-80 Model III	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Mail List, Visicalc
Radio Shack	TRS-80 Model II	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Mail List, Visicalc
SDS	420	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Legal Billing Medical Billing
SDS	432	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Legal Billing Medical Billing
SEE	6684	No	Std	Opt	Opt	Opt	Opt	Opt	Publisher's Accounting Travel Agency
SEE	6789	No	Std	Opt	Opt	Opt	Opt	Opt	Publisher's Accounting Travel Agency
Smoke Signal	9822	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Medical, Mailing
Smoke Signal	H9822	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Medical, Mailing
Technico	SS16	No	No	Opt	No	No	Opt	No	None
Technico	TI32	No	Opt	Opt	No	No	Opt	No	None
TI	DS990/1	No	No	No	No	No	No	No	None
Vector Graphics	VIP	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Communications
Vector Graphics	System B	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Communications
Xerox	Diablo 3000	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Medical, Dental, Legal
Xerox	Diablo 3200	Opt	Opt	Opt	Opt	Opt	Opt	Opt	Communications
Zilog	MCZ 1/50	Opt	No	Opt	Opt	Opt	Opt	Opt	Financial Modeling
Zilog	MCZ 1/70	Opt	No	Opt	Opt	Opt	Opt	Opt	Financial Modeling

Table 5. Corporate Data

Manufacturer's Address	Gross Sales	When Established	Dealers		Service Centers		On-Site Service?	System's 1st Delivery	Total Delivered
			US	Foreign	US	Foreign			
Associated Computer Industries 17751-H Sky Park East, Irvine, CA 92714	N/A	N/A	15	5	3	1	No	Feb 80	200
Applied Data Communications 14272 Chambers Rd., Tustin, CA 92680	$4M	1973	10	3	3	0	Yes	N/A	0
Applied Digital Data Systems 100 Marcus Blvd., Hauppauge, NY 11787	$50M	1969	N/A	N/A	N/A	N/A	Yes	Dec 80	N/A
Alpha Microsystems 17881 Sky Park North, Irvine, CA 92714	N/A	1977	200	75	200	75	Yes	Apr 77	5500
Altos Computer Systems 2360 Bering Dr., San Jose, CA 95131	$20M	1977	200	180	15	10	Yes	1979	1755
Billings Computer Corp. 2000 E. Billings, Provo, UT 84601	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BRD Inc. 12715 Miller Rd. Bainbridge Island, WA 98110	$800K	1969	50	2	50	2	Yes	1977	300
CADO Systems 2771 Toledo St., Torrance, CA 90503	$28M	1976	108	30	108	30	Yes	1978	3100
Codata Systems Corporation 285 N. Wolfe Rd., Sunnyvale, CA 94086	N/A	1978	4	1	0	0	No	N/A	N/A
COMPAL Computer Systems 6300 Variel Ave., Suite E Woodland Hills, CA 91367	N/A	1976	3	0	3	0	Yes	N/A	500
Computhink 965 W. Maude Ave., Sunnyvale, CA 94086	$5.5M	1976	14	17	14	17	No	Jan 80	N/A
Cromemco, Inc. 280 Bernardo Ave. Mountain View, CA 95014	N/A	1975	300	70	300	70	Yes	N/A	N/A
Datapoint Corporation 9725 Datapoint Drive San Antonio, TX 78284	$232M	1968	60	30	160	N/A	Yes	Oct 77	6000
Digital Microsystems 4448 Piedmont Ave., Oakland, CA 94611	$3M	1975	30	20	10	8	Yes	Apr 79	35
Durango Systems 3003 N. 1st St., San Jose, CA 95134	$12M	1977	50	30	N/A	N/A	Yes	Nov 78	2100
Dynabyte Inc. 115 Independence Dr., Menlo Park, CA	$4M	1977	200	25	200	25	Yes	1978	N/A
Heath Co. Benton Harbor, MI 49022	N/A	1926	57	6	57	6	Yes	1979	N/A
Integrated Business Computers 22010 S. Wilmington Ave., Suite 306 Carson, CA 90746	$1M	1978	40	10	1	0	No	N/A	N/A
IBM, General Systems Division 4111 Northside Parkway Atlanta, GA 30301	N/A	1924	50	N/A	N/A	N/A	Yes	1979	N/A
Industrial Micro Systems 628 N. Eckhoff St., Orange, CA 92688	$7M	1975	75	25	75	25	Yes	Jul 79	1300
MicroDaSys PO Box 36215, Los Angeles, CA 90036	$3M	1977	700	50	100	20	Yes	Jun 80	400
Ohio Scientific 1333 S. Chillocothe, Aurora, OH 44202	$30M	1975	250	80	N/A	N/A	Yes	1978	N/A
ONYX Systems 73 E. Trimble Rd., San Jose, CA 95131	N/A	1978	60	18	7	2	Yes	1979	1120
Pertec Computer Corp. 12910 Culver Blvd. Los Angeles, CA 90066	$148M	1967	100	60	86	9	Yes	N/A	N/A
Plessey Peripheral Systems 17466 Daimler Ave., Irvine, CA 92714	$50M	1935	N/A	N/A	N/A	N/A	Yes	N/A	1400
Radio Shack 1300 One Tandy Center Fort Worth, TX 76192	1.4B	1920	6085	1630	120	N/A	Yes	Jul 79	N/A
Scientific Data Systems 344 Main St., Venice, CA 90291	$1M	1977	25	5	25	5	Yes	Feb 79	N/A
Systems Engineering Enterprises 625 Lofstrand Lane, Rockville, MD 20850	$1M	1970	6	4	6	4	Yes	Jan 80	N/A
Smoke Signal Broadcasting 31336 Via Colinas Westlake Village, CA 91362	N/A	1976	100	25	100	25	Yes	Apr 80	100
Technico, Inc. 9051 Red Branch Rd. Columbia, MD 21045	$4M	1975	15	3	2	1	Yes	Dec 76	2030
Texas Instruments, Inc. 12501 N. Central Expressway Dallas, TX 75222	$3.22B	1930	0	0	120	169	Yes	Apr 79	N/A
Vector Graphic 31364 Via Colinas Westlake Village, CA 91362	$15M	1976	171	20	171	20	Yes	1980	8000
Xerox/Shasta General Systems 1329 Moffett Park Drive Sunnyvale, CA 94086	N/A	1972	50	0	50	0	Yes	Nov 76	1800
Zilog, Inc. 10460 Bubb Rd., Cupertino, CA 95014	N/A	1974	N/A	N/A	N/A	N/A	Yes	N/A	N/A

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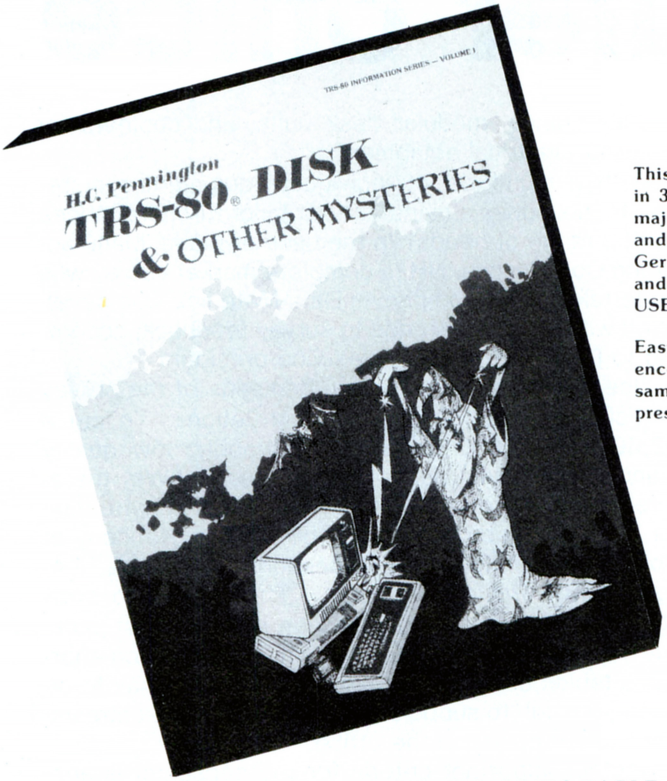

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1/81

Sprucing Up the Computer office

by Les Spindle

Picture this: A computer operator enthusiastically reports for his first day's work. He is placed at a rickety desk, quaking under the weight of a large keyboard and CRT terminal. The keyboard sits at an awkward typing height. The screen is difficult to read due to glare from the overhead lights. Worse yet, the input copy keeps sliding off his lap. (There is no room to place it on the narrow desk.) Something's got to give!

"You wouldn't expect a secretary to put up with such an awkward, uncomfortable work station," says Dan Foster of Input-Ez Corp., Englewood, CO. "Well, neither will a computer operator."

Foster is just one manufacturer who recognizes the burgeoning need for computer-designed furniture, and is taking positive steps to address that need. He sees the benefits of custom computer furniture as extending far beyond simple comfort. He cites a recent survey by the National Institute of Safety and Health. The survey presumed a possible link between cataracts and eyestrain with radiation links from CRT terminals. The preliminary findings revealed quite a different picture. The eye problems were traced to: the glare on the screen due to the angle it sits on; less than ideal seating conditions; and the proximity between the eye and the screen height.

Not just a whim

Foster feels that computer furniture can no longer be regarded as a luxury—an elitist manufacturing whim. It's rapidly becoming as necessary a part of the computer environment as the floppy disk. Foster's company specializes in the CRT work station, which he feels is crucial. The positions of the keyboard and the display screen must be ideally situated for simultaneous use. The operator must be able to read the input copy, enter data on the keyboard, and observe the output data on the CRT screen simultaneously. "Increased work efficiency, employee comfort and morale, and avoidance of eyestrain are all dependent on a well-designed work environment," says Foster.

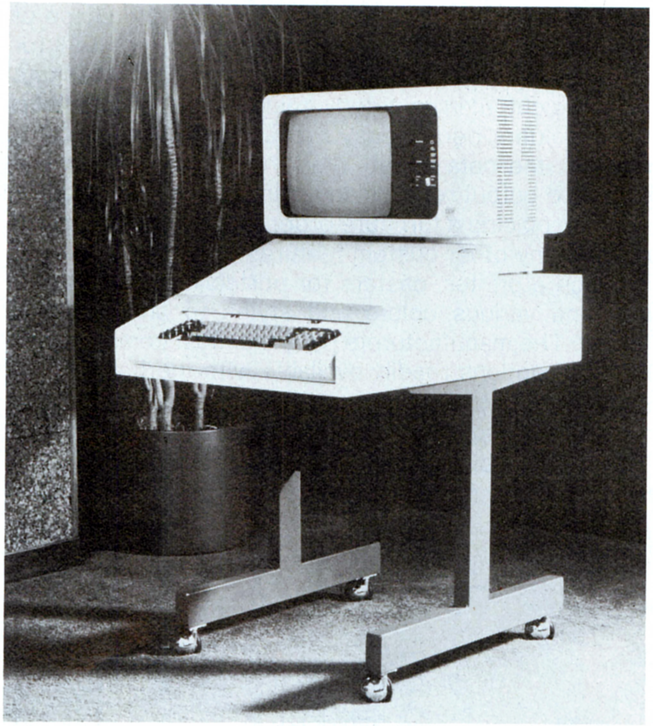
But the CRT work station only fulfills one need in the enormous furniture arena. Still in its infancy, the industry produces too many shapes, sizes, and configurations to fit easy categorization. The pieces are as individual as the diverse hardware components that they are designed to accommodate. But a few pieces are dominating the market: terminal desks and stands, printer stands, modular desk units, and cabinets for housing electrical equipment.

With a multitude of individual equipment requirements, how does a manufacturer tailor furniture pieces to fit a range of needs? In the case of Maine Manufacturing Co., Nashua, NH, a complete market survey was undertaken. The company's Data-Mate line was developed with strict adherence to survey feedback, according to Dana R. Powers, sales vice president.

One of the most vociferous demands of the survey participants was for quality construction. "To put a $2,000 or $3,000 printer on a wobbly, low quality stand is extremely risky," says Powers. "We, therefore, built our products with unitized steel construction for maximum security and durability." Lee Kennedy of Computer Furniture and Accessories, Gardena, CA, agrees with Power and adds, "The trick is to offer strength and durable construction in a compact package. The day of huge, cumbersome machines on enormous tables or desks is over. The structure has to be strong enough to support heavy equipment, yet streamlined to harmonize in the office."

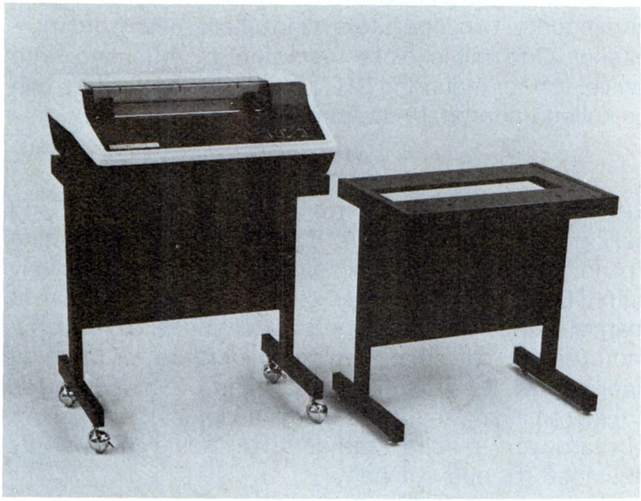
Another important criteria for the consumer is aesthetics. Powers says, "The automated office of the future must utilize modern, efficient, attractive furniture." Colors, textures, and materials vary according to the purchaser's tastes, but what really propels an office into the mainstream of modern fashion is the modular concept. A series of interconnectable work stations are ordered individually, or together, and arranged according to spatial and work-flow requirements. The units can be added to, deleted, or rearranged as equipment pieces or number of employees change. The modular concept has been instrumental in the success of the Data-Mate line, as well as the Optima series by Scientific-Atlanta (Tucker, GA) and the Omni-stations of Hoover Universal (Vernon, AL). The concept allows for maximum work efficiency, aesthetic harmony, and the stylish, modernistic look befitting the computer age.

Electrical machinery dictates another set of special demands, since equipment enclosures are often integrated directly within the desk configuration. Fans and air vents must be incorporated at strategic places to dissipate the heat generated by memory units and disk drives. Rails are placed at precisely measured spots to mount the necessary equipment. Holes must be properly placed for electrical cables to protrude through the desk to electrical outlets. A conventional desk from an office supply house simply will not meet these requirements.



CRT terminal stand integrates CRT platform with custom designed leg base so keyboard rests at proper height. Screen is set at desirable focus distance. Leg base available with glides or casters. Sitting and stand-up models available. In sloped platform model for hardware with back-slanted screens, CRT platform is constructed at an angle so it is perpendicular to operator's line of sight. Background reflections are minimized.

Input-Ez Corp., Englewood, CO



Universal printer stand fits Qume, TI810, Diablo, NEC, and several other printers. Options include paper catch baskets and casters. Many furniture companies are reaching beyond the OEM market to produce units for the end-user that are adaptable to a variety of hardware pieces, rather than items designed for just one company's equipment.

Computer Furniture and Accessories, Gardena, CA

Computer Furniture Outlets

The following list provides a consumer directory of a few major manufacturers and retailers supplying DP furniture.

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1411 W. 132nd St.
Gardena, CA 90249

Computer Furniture Systems
266 Summer St.
Boston, MA 02210

Computer Roomers, Inc.
2732 Seelco St.
Dallas, TX 75248

Electronic Enclosure Enterprises
4901 Morana Blvd., Suite 325
San Diego, CA 92117

Electronic Systems Furniture Co.
17129 Kingsview Ave.
Carson, CA 90746

Emcor Products
1600 4th Ave. NW
Rochester, MN 55901

Everest Electronic Equipment
2100 E. Orangewood Ave.
Anaheim, CA 92806

Furn-Wood Manufacturing
5664 SW Carman Dr.
Lake Grove, OR 97034

Hoover Universal (Omni-stations)
P.O. Box 699
Vernon, AL 35592

Input-Ez Corp.
P.O. Box 3444
Englewood, CO 80155

Maine Manufacturing Co.
Data-Mate Products
46 Bridge St.
Nashua, NH 03060

Optima (Scientific Atlanta Inc.)
2166 Mountain Industrial Blvd.
Tucker, GA 30084

Stantron
6918 Beck Ave.
N. Hollywood, CA 91605

Structural Concepts
1727 Van Wagoner
Spring Lake, MI 49456

Systems Furniture Co.
2727 Maricopa St.
Torrance, CA 90503

Toor Furniture Corp.
4935 McConnell Ave.
Los Angeles, CA 90066

Trimm Enclosure Products
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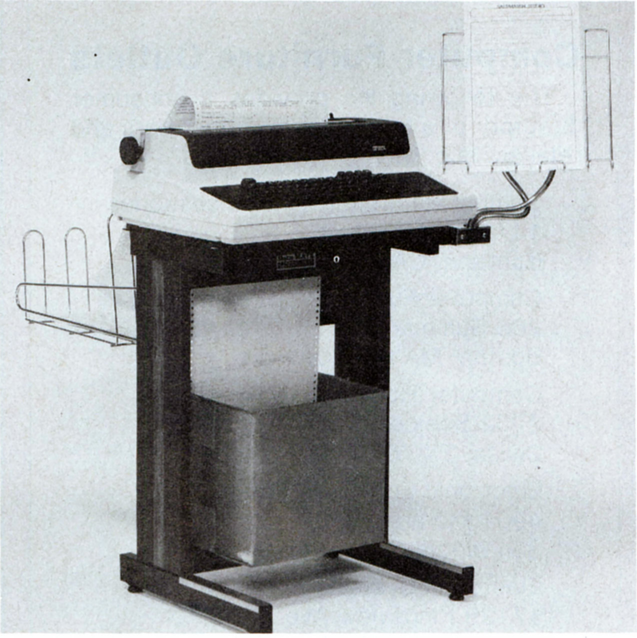
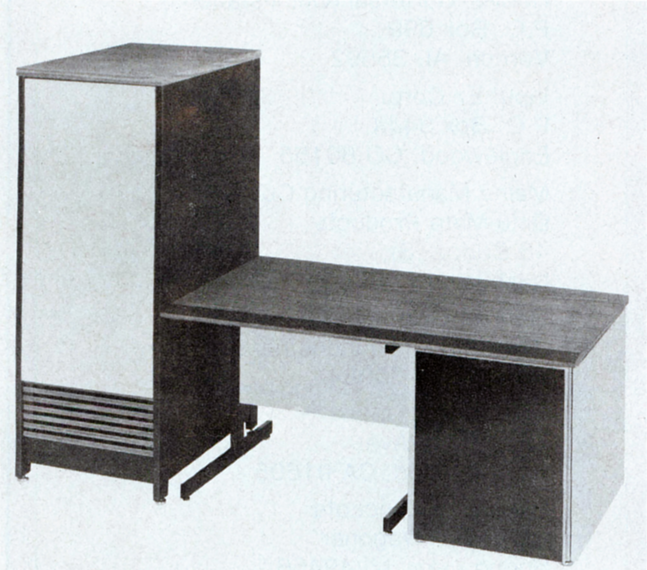
N. Hollywood, CA 91605



Printer stand specifically designed for DEC LA34 model. Constructed of welded steel. Offers ample leg room, even when 15-in. paper supply carton is used. Other options: rear paper catcher basket that keeps paper output off the floor, copy holder that adjusts for convenient placement of input data, side work holder baskets for in and out trays or storage of manuals.

Data-Mate Line, Maine Manufacturing Co., Nashua, NH



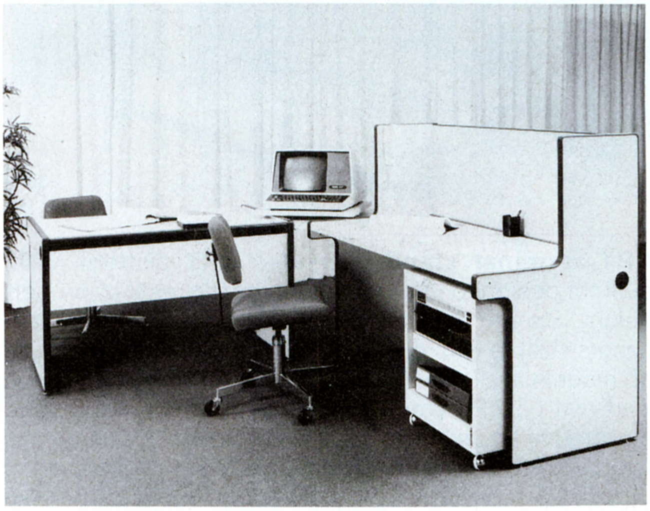
Vertical equipment enclosure can be integrated with data desk to provide convenient housing for computer equipment alongside the work station. Options include: casters, flush-mounted tops, pagoda tops, trim, front doors, and fan cutouts for tops. Three opening heights available. Each cabinet complete with welded frame, four adjustable mounting rails, hinged and removable side panels, one partial rear door (vented at top) and screw-on filler panel mounted at bottom rear.

Systems Furniture Co., Torrance, CA

Similarly, a printer will not function well placed on a standard equipment stand. Printer stands are configured to match up precisely with the size and shape of the unit, embellished by a number of features for streamlining the work flow. Paper catcher baskets keep the output in an orderly, folded stack, off the floor. Copy holders permit easy readability as the operator looks at the data sheet. Work holder baskets on the side hold output records and manuals for easy access.

When placing a furniture order, the customer can request many other custom features: a slit in a desk unit to place a printer, casters for portability, soundproofing, and various colors and styles to suit personal tastes. The manufacturers have the most commonly requested options readily available with the basic units, adding features according to the user's needs.

Where does the user go to place his custom order? The merchandising trend has been towards manufacturers who are solely in the business of making and selling computer furniture. But the market is opening up. Initially, the furniture companies dealt exclusively with OEMs, tailoring pieces specifically for the OEM to market alongside his computer equipment. Most manufacturers indicate that they now fill orders for the end-user as well. As a result, desks, stands, and enclosures are becoming more standardized, adaptable to a number of hardware pieces, rather than being exclusively designed for one company.



Modular word processing station designed to accommodate two operators who share one word processor. One unit is joined to another by articulator with swivel top for mounting CRT. Data cube on casters can be rolled underneath station.

Hoover Universal, Vernon, AL

"Everyone is finally realizing there's an enormous market out there," says Kennedy. "Even office supply houses are getting into the act." The office supply store can no longer afford to be a place that sells just pencils, notepads, conventional desks, and typewriter stands. The benefits of computer furniture have become too obvious to ignore.

"When you need to drive a nail, you don't pound away at it with the butt-end of a screwdriver," says Foster. Computer operators everywhere are echoing Foster's sentiment. ☐

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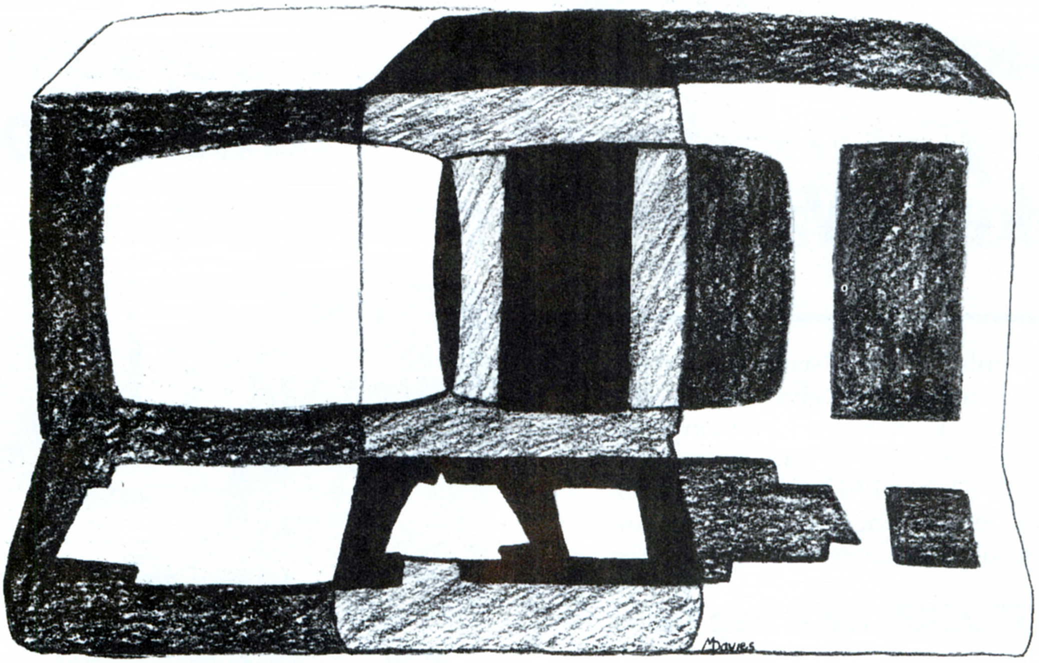
CIRCLE INQUIRY NO. 61

Compiler or Interpreter?

by Henry Davis
American Microsystems, Inc.
3800 Homestead Rd., Santa Clara, CA 95051



Few terms elicit stronger reactions in the programming community than ''compiler'' and ''interpreter''. Compilers are generally considered to be good while interpreters are bad. These judgements are often based on experience with well-written compilers and poorly-implemented interpreters. Additionally, many people have used the best available compilers on a mainframe computer and then unfairly compared it with a microcomputer system with a very poor interpreter.

To make a fair and objective analysis of language implementations, you need to know the details of what compilers and interpreters do. As you will see, the distinction can become blurred. This discussion deals with specifics of compilers or interpreters for microcomputers.

An interpreter, as the name implies, performs actions based on some source code. In other words, an interpreter is a computer program that reads source code for a language like Basic and alters its own memory and program flow based on instructions in source. Such an interpreter is called a pure interpreter because the actual source is kept in memory and is scanned every time the interpreter encounters the line.

Two problems are associated with this technique: too much memory is used and it is too slow. The problem of using too much memory can be quite significant in small memory machines. Memory inefficiency is due to the fact that the source is kept in its original form. For example, Basic allows you to declare array sizes using the 'dim' statement, thus a pure interpreter would use three bytes to store this word when only one byte is really necessary from an information content view. Another example is that of line numbers. Given five digits for a line number, storage as Ascii source would require five bytes, but the number it represents can be squeezed into no more than two bytes.

Typical microprocessor-based computers have at most 65K of memory or 16 bits of address space; interpreters fill that inefficiency.

While memory utilization is certainly of concern, pure interpreters can also be excruciatingly slow. This is because each character of the source must be scanned each time it is encountered. In the case of branching to a label, a pure interpreter requires rescanning the program from the beginning. So, if a program is very long but with a short loop at the end, each iteration of the loop requires a rescan of the entire source.

On the other end of the language spectrum is the optimizing compiler that produces native code. A compiler is a computer program that translates from some source language to some target (machine) language. For example, a 9900 Fortran compiler translates Fortran source code to the machine language of the 9900.

Most people automatically think of native code generation when the word compiler is discussed. Native code simply means that, unlike interpretive code, the target processor can directly execute the resulting code. The result is a program that may execute considerably faster than interpretive code. How good the code is in relation to hand coding is a function of the effort spent by the compiler writer in implementing code optimization. Unfortunately, the vast majority of compilers do not optimize the code. In addition, most 8-bit instruction sets do not have the right instructions or addressing modes to be the object of a compiler.

Thus far, only two approaches to implementing high level languages have been presented. In reality, few interpreters are pure. Instead, most interpreters utilize many of the techniques used in compilers. In this way, source code is prescanned and translated into an internal form more compact than the actual source. Additionally, interpretation is faster because source no longer needs to be rescanned and labels, quotes, etc., can be implemented using pointers, so interpretation always continues at the correct place in the program without searching for the actual labels.

The big advantage that interpretive implementations have is that the compressed code is very dense in comparison to native code. This means that larger programs can be squeezed into smaller memory spaces. However, a speed penalty is incurred. With a good implementation on an 8-bit processor, the speed difference can be quite small due to the usually inappropriate instructions set. This is evident when you consider that most high level languages require at least 16-bit arithmetic and other higher level operations. Thus, native code frequently consists of many subroutine calls or significant code duplications.

Definitions become fuzzy

While the distinction between compiler and interpreter is still quite clear, the difference becomes blurred as soon as real compilers enter the picture. A good example of this is a Fortran compiler. The language definition requires that at least a portion of the code be interpretive. In particular, 'format' statements may be read in at run time thus requiring a 'format' statement interpreter. Similar problems are inherent in other languages. The point of the previous examples is that real implementations often combine the two techniques.

Just as prescanning in interpreters saves memory, code threading saves memory with minimal time overhead. In microprocessor code from a compiler, subroutine calls tend to have a high frequency. Examining a typical subroutine call shows that one byte is used for the opcode and two for the address. The threading technique eliminates the opcode and leaves the two byte address. Subroutine calls are then made through an indirect jump at the beginning of the program and at the end of each subroutine. Taking this technique one step further can reduce the address to a single byte that is a vector address. AMI has used this technique in implementing AMI Pascal and Fortran-77. Admittedly, the difference between interpretive and threaded code on a microprocessor is minimized but the threading technique does save execution time while achieving high code density.

It is interesting to note that Digital Equipment Corp. has utilized this technique extensively in its compilers. Small memory systems in conjunction with 8-bit microprocessors virtually require threading or interpretive technique in order to implement large programs. With 16-bit processors, the need to use memory saving techniques is lessened, but still not eliminated. The ultimate key to any language implementation is its efficiency tradeoffs between memory, size and speed. Compilers give you the added advantage of being able to optimize the resulting code where an interpreter usually does not.

What the preceding discussion leads to is the observation that good implementations are good while bad implementations are bad. Interpreters, threading and native code get the job done with varying degrees of efficiency tradeoff. For the majority of small systems, my personal preference is the threaded approach. The suitability of a given implementation has to be considered for each application. □

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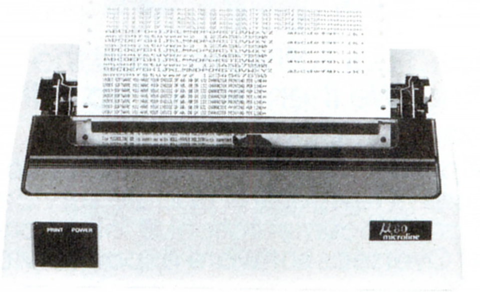

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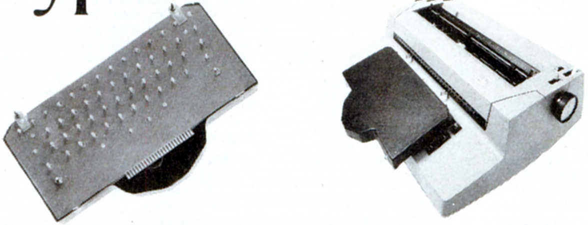

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☐ **CP/M* FLOPPY DISK OPERATING SYSTEM**—Digital Research's operating system configured for many popular micro-computers and disk systems:

System	Version	Price	
Apple II*	2.x	**349/NA**	◇
New SoftCard* with Z80 Microsoft BASIC version 5 with high resolution graphics			
North Star Single Density	2.x	**170/25**	
North Star Double/Quad	2.x	**170/25**	
Durango F-85	2.x	**170/25**	
iCOM Micro-Disk 2411	1.4	**145/25**	
iCOM 3712 for MITS 88-2SIO Console	1.4	**170/25**	*
iCOM 3712 for 3PtS/MITS SIO Rev non-zero console	1.4	**170/25**	*
iCOM 3812	1.4	**170/25**	*
iCOM 4511/Pertec D3000	2.x	**375/25**	* +
Mits 3202/Altair 8800	1.4	**145/25**	
Heath H8 + H17	1.4	**145/25**	Ⓜ
Heath H89	1.4	**145/25**	Ⓜ
Heath H89 by Magnolia	2.x	**250/25**	◇
Ohio Scientific C3	2.x	**200/25**	
Onyx C8001 Standard	2.x	**250/25**	
Onyx C8001 Enhanced	2.x	**330/25**	
TRS-80 Model I	1.4	**145/25**	Ⓜ
TRS-80 Model II	2.x	**170/25**	
TRS-80 Model II + Corvus	2.x	**250/25**	
Processor Technology Helios II	1.4	**145/25**	
Intel MDS Single Density	2.x	**170/25**	
Intel MDS Double Density	2.x	**170/25**	
Micropolis Mod I	2.x	**200/25**	Ⓥ
Micropolis Mod II	2.x	**200/25**	Ⓥ
Mostek MDX STD Bus System	2.x	**350/25**	**

The following configurations are scheduled for release soon:

North Star Double/Quad + Corvus	2.x	**250/25**	
Ohio Scientific C3-C	2.x	**250/25**	
iCOM 3812	2.x	**225/25**	*
iCOM 4511/Pertec D3000	2.x	**375/25**	* +

*Software consists of the operating system, text editor, assembler, debugger and other utilities for file management and system maintenance. Complete set of Digital Research's documentation and additional implementation notes included. Systems marked * and ** include firmware on 2708 and 2716. Systems marked + include 5440 media charge. Systems marked Ⓜ require the special Ⓜ versions of software in this catalog. ◇ includes hardware addition to allow our standard versions of software to run under it.*

☐ Ⓜ Ⓩ **Z80 DEVELOPMENT PACKAGE**—Consists of: (1) disk file line editor, with global inter and intra-line facilities; (2) Z80 relocating assembler, Zilog/Mostek mnemonics, conditional assembly and cross reference table capabilities; (3) linking loader producing absolute Intel hex disk file . . . . . **$95/$20**

☐ Ⓜ Ⓩ **ZDT**—Z80 Monitor Debugger to break and examine registers with standard Zilog/Mostek mnemonic disassembly displays. $35 when ordered with Z80 Development Package . . . . . **$50/$10**

AVOCET SYSTEMS

☐ **XASM-68**—Non-macro cross-assembler with nested conditionals and full range of pseudo operations. Assembles from standard Motorola MC6800 mnemonics to Intel hex . . . **$200/$25**

☐ **XASM-65**—As XASM-68 for MOS Technology MCS-6500 series mnemonics . . . . . **$200/$25**

☐ **XASM-48**—As XASM-68 for Intel MCS-48 and UPI-41 families . . . . . **$200/$25**

☐ **XASM-18**—As XASM-68 for RCA 1802 . . . . . **$200/$25**

☐ **DISTEL**—Disk based disassembler to Intel 8080 or TDL/Xitan Z80 source code, listing and cross reference files, Intel or TDL/Xitan pseudo ops optional. Runs on 8080 . . . . . **$65/$10**

Genuine CP/M for Apple II Available now!

Software with Manual / Manual Alone

☐ Ⓜ Ⓩ **DISILOG**—As DISTEL to Zilog/Mostek mnemonic files . . . . . **$65/$10**

☐ Ⓧ **SMAL/80** Structured Macro Assembler Language—Package of powerful general purpose text macro processor and SMAL structured language compiler. SMAL is an assembler language with IF-THEN-ELSE, LOOP-REPEAT-WHILE, DO-END, BEGIN-END constructs. Not compatible with CP/M version 2 or greater. . . . . **$75/$15**

PHOENIX SOFTWARE ASSOCIATES

☐ Ⓩ **PASM***—Z80 macro assembler, Intel/TDL mnemonics. Generates Intel hex format or relocatable code in either TDL Object Module format or PSA Relocatable Binary Module format. Supports text insertion, conditional branching within macros, recursive macro calls and parameter passing. . . . . **$129/$25**

☐ Ⓩ **EDIT**—Character oriented text file editor. Includes macro definition capabilities. Handles insertion, deletion, searching, block move, etc. for files of any length. Does not require a CRT. . . . . **$129/$25**

New

☐ Ⓩ **PLINK***—Two pass **disk-to-disk linkage editor/loader** which can produce re-entrant, ROMable code. Can link programs that are larger than available memory for execution targeted on another machine. Full library capabilities. Input can be PSA Relocatable Binary Module, TDL Object Module or **Microsoft REL files**. Output can be a COM file, Intel hex file, TDL Object Module or PSA Relocatable file. . . . . **$129/$25**

New

☐ Ⓩ **BUG* and μBUG***—Z80 interactive machine level debugging tools for program development. BUG has full symbolic trace and interactive assembly (mnemonics compatible with PASM). Dynamic breakpoints and conditional traps while tracing (even through ROM!). μBUG is a subset of BUG and is used in memory limited situations . . . . . **$129/$25**

DIGITAL RESEARCH

☐ **MP/M**—Installed for single density MDS-800. Multi-processing derivative of the CP/M operating system. Manual includes CP/M2 documentation . . . . . **$300/$50**

☐ Ⓢ **MAC**—8080 Macro assembler. Full Intel macro definitions. Pseudo Ops include RPC, IRP, REPT, TITLE, PAGE, and MACLIB. Produces absolute hex output plus symbol table file for use by SID and ZSID (see below) . . **$120/$15**

☐ Ⓢ **SID**—8080 Symbolic debugger. Full trace, pass count and breakpoint program testing. Has backtrace and histogram utilities. When used with MAC, provides full symbolic display of memory labels and equated values . **$105/$15**

☐ Ⓢ Ⓩ **ZSID**—Z80 Symbolic debugger with all features of SID . . . . . **$130/$15**

☐ Ⓢ **TEX**—Text output formatter to create paginated, page-numbered and justified copy. Output can be directed to printer or disk . . . **$105/$15**

☐ Ⓢ **DESPOOL**—Utility program to permit simultaneous printing from text files while executing other programs . . . . . **$80/$10**

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☐ Ⓧ **tiny C**—Interactive interpretive system for teaching structured programming techniques. Manual includes full source listings . **$105/$50**

New Version

☐ Ⓜ Ⓘ **BDS C COMPILER**—Supports structures, unions, 2 dimensional arrays, pointers, recursion and overlays. Features optimized code generator, variable sized buffers for file I/O, and capability to produce ROMable code. Includes macro package to enable user to produce linkable modules with MAC (see under Digital Research). Floating point functions, full run-time package and machine code library sources provided. Linker, library manager and textbook included. Compiler lacks initializers, statics, floats and longs. . . . . **$145/$25**

Software with Manual / Manual Alone

☐ Ⓛ Ⓧ **WHITESMITHS C COMPILER**—The ultimate in systems software tools. Produces faster code than a pseudo-code Pascal with more extensive facilities. Conforms to the full UNIX* Version 7 C language, described by Kernighan and Ritchie, and makes available over 75 functions for performing I/O, string manipulation and storage allocation. Linkable to Microsoft REL files. Requires 60K CP/M . . . . . **$630/$30**

MICROSOFT

☐ Ⓛ Ⓜ **BASIC-80**—Disk Extended BASIC, ANSI compatible with long variable names, WHILE/WEND, chaining, variable length file records. MBASIC version 4.51 also included on disk. . . . . **$325/$25**

☐ Ⓛ Ⓜ **BASIC COMPILER**—Language compatible with BASIC-80 and 3-10 times faster execution. Produces standard Microsoft relocatable binary output. Includes MACRO-80. Also linkable to FORTRAN-80 or COBOL-80 code modules . . . . . **$350/$25**

☐ Ⓛ Ⓜ **FORTRAN-80**—ANSI 66 (except for COMPLEX) plus many extensions. Includes relocatable object compiler, linking loader, library with manager. Also includes MACRO-80 (see below) . . . . . **$425/$25**

☐ Ⓛ Ⓜ **COBOL-80**—Level 1 ANSI '74 standard plus most of Level 2. Full sequential, relative, and indexed file support with variable file names. Powerful interactive, formatted screen handling with ACCEPT and DISPLAY verbs. Program segmentation for execution of programs larger than memory and CHAIN command with parameter passing. Full support of CP/M version 2 files. Includes MACRO-80 (see above), linking loader, and relocatable library manager. Requires 48K CP/M . . . . . **$700/$25**

☐ Ⓛ Ⓜ **MACRO-80**—8080/Z80 Macro Assembler. Intel and Zilog mnemonics supported. Relocatable linkable output. Loader, Library Manager and Cross Reference List utilities included . . . . . **$149/$15**

☐ Ⓛ **XMACRO-86**—8086 cross assembler. All Macro and utility features of MACRO-80 package. Mnemonics slightly modified from Intel ASM86. Compatibility data sheet available . . . . . **$275/$25**

☐ Ⓛ **EDIT-80**—Very fast random access text editor for text with or without line numbers. Global and intra-line commands supported. File compare utility included. . . . . **$89/$15**

☐ Ⓧ **PASCAL/M***—Compiles enhanced Standard Pascal to compressed efficient Pcode. Totally CP/M compatible. Random access files. Both 16 and 32-bit Integers. Runtime error recovery. Convenient STRINGs. OTHERWISE clause on CASE. Comprehensive manual (90 pp. indexed). SEGMENT provides overlay structure. INPORT, OUTPORT and untyped files for arbitrary I/O. Requires 56K CP/M. Specify 1) 8080 CP/M, 2) Z80 CP/M, or 3) Cromemco CDOS. . . . . **$175/$20**

☐ Ⓘ Ⓩ **PASCAL/Z**—Z80 native code PASCAL compiler. Produces optimized, ROMable re-entrant code. All interfacing to CP/M is through the support library. The package includes compiler, relocating assembler and linker, and source for all library modules. Variant records, strings and direct I/O are supported. Requires 56K CP/M . . . . . **$395/$25**

☐ Ⓜ Ⓧ **PASCAL/MT**—Subset of standard PASCAL. Generates ROMable 8080 machine code. Symbolic debugger included. Supports interrupt procedures, CP/M file I/O and assembly language interface. Real variables can be BCD, software floating point, or AMD 9511 hardware floating point. Includes strings enumerations and record data types. Manual explains BASIC-PASCAL conversion. Requires 32K . **$250/$30**

☐ Ⓩ **APL/V80**—Concise and powerful language for application software development. Complex programming problems are reduced to simple expressions in APL. Features include up to 27K active workspace, shared variables, arrays of up to 8 dimensions, disk workspace and copy object library. The system also supports auxiliary processors for interfacing I/O ports. Requires 48K CP/M and serial APL printing terminal or CRT . . . . . **$500/$30**

☐ Ⓩ Ⓜ **ALGOL-60**—Powerful block-structured language compiler featuring economical run-time dynamic allocation of memory. Very compact (24K total RAM) system implementing almost all Algol 60 report features plus many powerful extensions including string handling direct disk address I/O etc. . . . . **$199/$20**

☐ Ⓜ **CBASIC-2** Disk Extended BASIC—Non-interactive BASIC with pseudo-code compiler and run-time interpreter. Supports full file control, chaining, integer and extended precision variables, etc. Versions of CRUN for CP/M versions 1.4 and 2.x included on disk. . **$120/$15**

MICRO FOCUS

☐ Ⓛ **STANDARD CIS COBOL**—ANSI '74 COBOL standard compiler fully validated by U.S. Navy tests to ANSI level 1. Supports many features to level 2 including dynamic loading of COBOL modules and a full ISAM file facility. Also, program segmentation, interactive debug and powerful interactive extensions to support protected and unprotected CRT screen formatting from COBOL programs used with any dumb terminal . . . . . **$850/$50**

☐ Ⓛ **FORMS 2**—CRT screen editor. Output is COBOL data descriptions for copying into CIS COBOL programs. Automatically creates a query and update program of indexed files using CRT protected and unprotected screen formats. No programming experience needed. Output program directly compiled by STANDARD CIS COBOL . . . . . **$200/$20**

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New

☐ Ⓜ **NEVADA COBOL**—Subset of ANSI-74. Features fast compilation and execution with small object modules. Has extended arithmetic with 18 digit accuracy. Extended I/O includes random access files and sequential files of both fixed and variable length records, and interactive accept/display verbs. Good error messages and debugging facilities enhance program development. Requires a 32K CP/M system . . . . . **$149/$25**

EIDOS SYSTEMS

☐ Ⓛ **KBASIC**—Microsoft Disk Extended BASIC version 4.51 integrated with KISS Multi-Keyed Index Sequential and Direct Access file management as 9 additional BASIC commands. KISS included as relocatable modules linkable to FORTRAN-80, COBOL-80, and BASIC COMPILER. Specify CP/M version 1.4 or 2.x when ordering. Requires 48K CP/M **$585/$45**
To licensed users of Microsoft BASIC-80 (MBASIC) . . . . . **$435/$45**

☐ **XYBASIC** Interactive Process Control BASIC—Full disk BASIC features plus unique commands to handle byte rotate and shift and to test and set bits. Available in several versions:

Integer ROM squared	**$350/$25**
Integer CP/M	**$350/$25**
Extended ROM squared	**$450/$25**
Extended CP/M	**$450/$25**
Extended Disk CP/M	**$550/$25**
Integer CP/M Run Time Compiler	**$350/$25**
Extended CP/M Run Time Compiler	**$450/$25**

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☐ **RECLAIM**—A utility to validate media under CP/M. Program tests a diskette or hard disk surface for errors, reserving the imperfections in invisible files, and permitting continued usage of the remainder. Essential for any hard disk. Requires CP/M version 2. . . . . **$80/$5**

☐ Ⓜ **BASIC UTILITY DISK**—Consists of: (1) CRUNCH-14— Compacting utility to reduce the size and increase the speed of programs in Microsoft BASIC 4.51, BASIC-80 and TRS-80 BASIC. (2) DPFUN—Double precision subroutines for computing nineteen transcendental functions including square root, natural log, log base 10, sine, arc sine, hyperbolic sine, hyperbolic arc sine, etc. Furnished in source on diskette and documentation . . . . . **$50/$35**

☐ **STRING/80**—Character string handling plus routines for direct CP/M BDOS calls from FORTRAN and other compatible Microsoft languages. The utility library contains routines that enable programs to chain to a COM file, retrieve command line parameters and search file directories with full wild card facilities. Supplied as linkable modules in Microsoft format. **$95/$20**

☐ **STRING/80** source code available separately— **$295/NA**

☐ Ⓜ **THE STRING BIT**—FORTRAN character string handling. Routines to find, fill, pack, move, separate, concatenate and compare character strings. This package completely eliminates the problems associated with character string handling in FORTRAN. Supplied with source . . . . . **$65/$15**

☐ Ⓜ **VSORT**—Versatile sort/merge system for fixed length records with fixed or variable length fields. VSORT can be used as a stand-alone package or loaded and called as a subroutine from CBASIC-2. When used as a subroutine, VSORT maximizes the use of buffer space by saving the TPA on disk and restoring it on completion of sorting. Records may be up to 255 bytes long with a maximum of 5 fields. Upper/lower case translation and numeric fields supported. . . . . **$175/$20**

☐ **CPM/374X**—Has full range of functions to create or re-name an IBM 3741 volume, display directory information and edit the data set contents. Provides full file transfer facilities between 3741 volume data sets and CP/M files . . . . . **$195/$10**

Coming Soon

CPAids*

☐ Ⓛ † **MASTER TAX**—Professional tax preparation program. Prepares schedules A, B, C, D, E, F, G, R/RP, SE, TC, ES and forms 2106, 2119, 2210, 3468, 3903, 2441, 4625, 4726, 4797, 4972, 5695 and 6251. Printing can be on readily available, pre-printed continuous forms, on overlays, or on computer generated, IRS approved forms. Maintains client history files and is interactive with CPAids GENERAL LEDGER II (see below) . . . . . **$995/$30**
Annual Update Fee **$350**

☐ † **STANDARD TAX**—As above for schedules A, B, C, D, E, G, R/RP, SE, TC and forms 2106 and 2441. Also, does not maintain client history files . . . . . **$495/$30**
Annual Update Fee **$175**

☐ † **GENERAL LEDGER II**—Designed for CPA's. Stores complete 12 month detailed history of transactions. Generates financial statements, depreciation, loan amortizations, journals, trial balances, statements of changes in financial position, and compilation letters. Includes payroll system with automatic posting to general ledger. Prints payroll register, W2's and payroll checks. . . . . **$450/$30**

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New

☐ **T/MAKER**—Powerful new tool for preparing management reports with tabular data. Makes financial modeling projects easy. Do you want a weekly profitability report? Set up the table and compute. Just change the sales figures for next week and compute. You have a new report! T/MAKER includes a full screen editor for setting up tables which pages left, right, up and down. Compute includes standard arithmetic, percents, exponents, common transcendental functions, averages, maxima, minima, projections, etc. Requires 48K CP/M, CBASIC-2, CRT Terminal with addressable cursor positioning. . . . . **$275/$25**

☐ Ⓜ **BSTAM**—Utility to link one computer to another also equipped with BSTAM. Allows file transfers at full data speed (no conversion to hex), with CRC block control check for very reliable error detection and automatic retry. We use it! It's great! Full wildcard expansion to send ⋆. COM, etc. 9600 baud with wire. 300 baud with phone connection. **Both** ends need one. Standard and Ⓜ versions can talk to one another. This software requires a knowledge of assembler language for installation. . . . . . **$150/$10**

New

☐ Ⓜ **BSTMS**—Intelligent terminal program for CP/M systems. Permits communication between micros and mainframes. Sends character data files to remote computers under complete control. System can record character data sent from remote computer systems and data banks. Includes programs to EXPAND and COMPRESS binary files for transmission. This software requires a knowledge of assembler language for installation. . . . . . **$200/$25**

☐ **WHATSIT?***—Interactive data-base system using associative tags to retrieve information by subject. Hashing and random access used for fast response. Requires CBASIC-2 . **$175/$25**

☐ † Ⓜ **SELECTOR III-C2**—Data Base Processor to create and maintain multi-key data bases. Prints formatted sorted reports with numerical summaries or mailing labels. Comes with sample applications, including Sales Activity, Inventory, Payables, Receivables, Check Register, and Client/Patient Appointments, etc. Requires CBASIC-2. Supplied in source . . . . . **$295/$20**

☐ **GLECTOR**—General Ledger option to SELECTOR III-C2. Interactive system provides for customized COA. Unique chart of transaction types insure proper double entry bookkeeping. Generates balance sheets, P&L statements and journals. Two year record allows for statement of changes in financial position report. Supplied in source. Requires SELECTOR III-C2. CBASIC-2 and 56K system. . . . . **$350/$25**

DMA

☐ † **CBS**—Configurable Business System is a comprehensive set of programs for defining custom data files and application systems without using a programming language such as BASIC, FORTRAN, etc. Multiple key fields for each data file are supported. Set-up program customizes system to user's CRT and printer. Provides fast and easy interactive data entry and retrieval **with transaction processing**. Report generator program does complex calculations with stored and derived data, record selection with multiple criteria, and custom formats. Sample inventory and mailing list systems included. **No support language required** . . . . **$395/$40**

MICROPRO

☐ Ⓛ **SUPER-SORT I**—Sort, merge, extract utility as absolute executable program or linkable module in Microsoft format. Sorts fixed or variable records with data in binary, BCD. Packed Decimal, EBCDIC, ASCII, floating & fixed point, exponential, field justified, etc. Even variable number of fields per record! . . . . . **$225/$25**

☐ Ⓛ **SUPER-SORT II**—Above available as absolute program only . . . . **$175/$25**

☐ Ⓛ **SUPER-SORT III**—As II without SELECT/EXCLUDE . . . . **$125/$25**

☐ Ⓛ **DATASTAR**—Professional forms control entry and display system for key-to-disk data capture. Menu driven with built-in learning aids. Input field verification by length, mask, attribute (i.e. upper case, lower case, numeric, auto-dup, etc.). Built-in arithmetic capabilities using keyed data, constant and derived values. Visual feedback for ease of forms design. Files compatible with CP/M-MP/M supported languages. Requires 32K CP/M . . . . **$350/$35**

☐ Ⓛ **WORD-STAR**—Menu driven visual word processing system for use with standard terminals. Text formatting performed on screen. Facilities for text paginate, page number, justify, center and underscore. User can print one document while simultaneously editing a second. Edit facilities include global search and replace, Read/Write to other text files, block move, etc. Requires CRT terminal with addressable cursor positioning . . . . **$445/$40**

☐ Ⓛ **WORD-STAR-MAIL-MERGE**—As above with option for production mailing of personalized documents with mail lists from DATASTAR or NAD . . . . **$575/$40**

☐ Ⓛ **WORD-MASTER** Text Editor—In one mode has superset of CP/M's ED commands including global searching and replacing, forwards and backwards in file in video mode, provides full screen editor for users with serial addressable-cursor terminal . . . . . . **$145/$25**

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New

☐ **MAGIC WAND***—Word processing system with simple, easy to use full screen text editor and powerful print processor. Editor has all standard editing functions including text insert and delete, global search and replace, block move and library files for boiler plate text. Print processor formatting commands include automatic margins, pagination, headings & footings, centered and justified text. Also prints with true proportional spacing, merges with data files for automatic form letters, and performs run-time conditional testing for varied output. Requires 32K CP/M and CRT terminal with addressable cursor. . . . . **$395/$40**

☐ Ⓜ **TEXTWRITER III**—Text formatter to justify and paginate letters and other documents. Special features include insertion of text during execution from other disk files or console, permitting recipe documents to be created from linked fragments on other files. Has facilities for sorted index, table of contents and footnote insertions. Ideal for contracts, manuals, etc. Now compatible with Electric Pencil* and Word-Star prepared files . . . . **$125/$20**

New

☐ **DATEBOOK**—Program to manage time just like an office appointment book but using the speed and memory of a computer. Keeps track of three appointment schedules (three dental chairs, three attorneys, etc.) at once. Appointments consist of name, reason for the appointment, the date and time, and the length of the appointment. System can be quickly customized for the individual user. Many helpful features for making, changing, finding, and reporting appointments. Requires 48K CP/M and 180K bytes diskette storage. Not available for Apple CP/M. Specify 8080 CP/M, Z80 CP/M or Cromemco CDOS . . . . **$295/$25**

New lower prices for application Software

PEACHTREE SOFTWARE*

☐ Ⓛ † General accounting software for small businesses. Each product can be used alone or with automatic posting to the general ledger. Supplied in source for Microsoft BASIC 4.51.

GENERAL LEDGER	**$530/$40**
ACCOUNTS PAYABLE	**$530/$40**
ACCOUNTS RECEIVABLE	**$530/$40**
PAYROLL	**$530/$40**
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☐ Ⓛ Other application products supplied in source for Microsoft BASIC 4.51.

† MAILING ADDRESS	**$530/$40**
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GRAHAM-DORIAN SOFTWARE SYSTEMS

☐ Ⓛ Ⓜ † Comprehensive accounting software written in CBASIC-2 and supplied in source code. Each software package can be used as a stand-alone system or integrated with the General Ledger for automatic posting to ledger accounts. Requires CBASIC-2.

GENERAL LEDGER	**$805/$40**
ACCOUNTS PAYABLE	**$805/$40**
ACCOUNTS RECEIVABLE	**$805/$40**
INVENTORY SYSTEM	**$555/$40**
JOB COSTING	**$805/$40**
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☐ Ⓜ **POSTMASTER**—A comprehensive package for mail list maintenance that is completely menu driven. Features include keyed record extraction and label production. A form letter program is included which provides neat letters on single sheet or continuous forms. Includes NAD file translator. Requires CBASIC-2. . . . . **$150/$20**

STRUCTURED SYSTEMS GROUP

☐ † Complete interactive accounting software for business. Each product can be used stand-alone or with automatic posting to the general ledger. Each product is thoroughly tested and very well documented.

GENERAL LEDGER	**$820/$40**
ACCOUNTS RECEIVABLE	**$820/$40**
ACCOUNTS PAYABLE	**$820/$40**
PAYROLL	**$820/$40**
INVENTORY CONTROL	**$820/$40**

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☐ † **ANALYST**—Customized data entry and reporting system. User specifies up to 75 data items per record. Interactive data entry, retrieval, and update facility makes information management easy. Sophisticated report generator provides customized reports using selected records with multiple level breakpoints for summarization. Requires a disk sort utility such as QSORT, SUPER-SORT or VSORT. . . . . **$250/$15**

☐ **LETTERIGHT**—Program to create, edit and type letters or other documents. Has facilities to enter, display, delete and move text, with good video screen presentation. Integrates with NAD for form letter mailings. . . . . . . **$200/$25**

☐ **NAD**—Name and Address selection system. Interactive mail list creation and maintenance program with output as full reports with reference data or restricted information for mail labels. System for extraction and transfer of selected records to create new files. **$100/$20**

☐ **QSORT**—Fast sort/merge program for files with fixed record length, variable field length information. Up to five ascending or descending keys. Full back-up of input files created . . . . **$100/$20**

CONDIMENTS

☐ **HEAD CLEANING DISKETTE**—Cleans the drive Read/Write head in 30 seconds. Diskette absorbs loose oxide particles, fingerprints, and other foreign particles that might hinder the performance of the drive head. Lasts at least 3 months with daily use. Specify 5″ or 8″.

Single sided	**$20 each/$55 for 3**
Double sided	**$25 each/$65 for 3**

☐ **DC 300 Data Cartridges** Specify 450′XL or 300′ certified. Pack of 5. . . . . **$100**

☐ **FLIPPY DISK KIT**—Template and instructions to modify single sided 5¼″ diskettes for use of second side in single sided drives **$12.50**

☐ **FLOPPY SAVER**—Protection for center holes for 5″ and 8″ floppy disks. Only 1 needed per diskette. Kit contains centering post, pressure tool and tough 7 mil mylar reinforcing rings for 25 diskettes.

5″, Kit	**$14.95**
5″, Rings only	**$7.95**
8″, Kit	**$16.95**
8″, Rings only	**$8.95**

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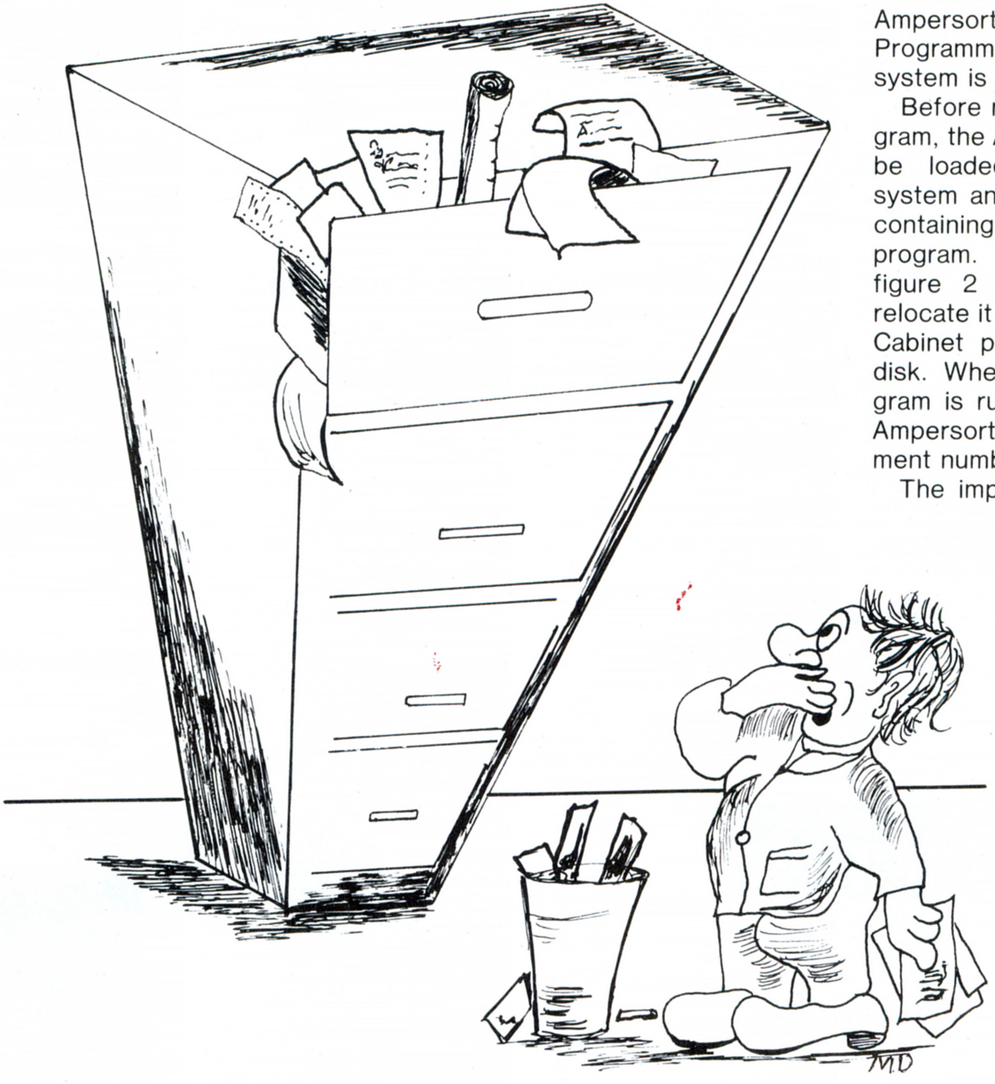
File Cabinet and Ampersort II

by Dr. R.F. Zant



The File Cabinet program from Apple Computer (IA Apr 80) is a good, generalized data handling system. The program processes a file of data by first reading the entire file into RAM and then adding records, deleting records, sorting or printing the records while they are in RAM.

The major disadvantage to an otherwise excellent program is the slowness with which the sorting routine works. The problem lies not so much with the algorithm used, as with the limitations of using Basic code to implement the sorting procedure. A natural solution to this problem is to substitute a sort routine that is written in machine language. The statements in figure 1 will accomplish this. They link the File Cabinet program to Alan Hill's Ampersort II program marketed by Programma International (a disk system is assumed).

Before running the modified program, the Ampersort II routine must be loaded into your computer system and saved on the diskette containing the new File Cabinet program. The dialogue given in figure 2 will load Ampersort II, relocate it for use with the new File Cabinet program, and save it on disk. When the File Cabinet program is run, the saved version of Ampersort II will be loaded by statement number 1032.

The improvement in sort speed gained by using the machine language routine is astonishing. Using a sample file composed of 185 records with an average record length of about 22 characters, sort time was decreased from 24 minutes to nearly 1 second for a 3-character numeric sort field. For an alphabetic sort field with an average length

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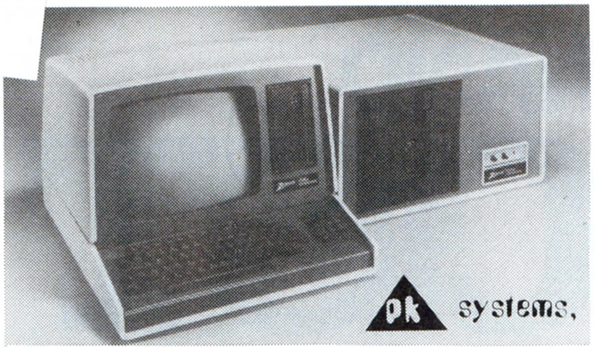

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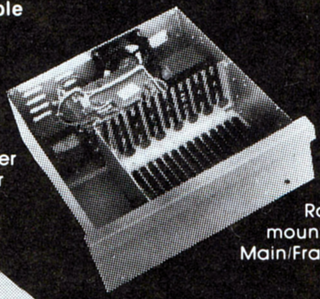

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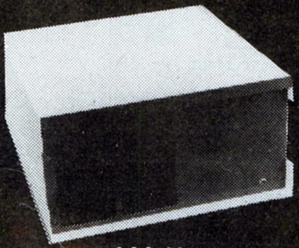

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of 15 characters, the reduction was from 20 minutes to less than 2 seconds.

There is one constraint imposed by these modifications. Ampersort II is used only in this modification to sort character strings. However, since numeric values are stored in their character equivalent form by File Cabinet, numeric values may still be sorted. All that is required is that numeric values be entered with leading zeros and all values stored under a given header contain the same number of characters.

For example, if the largest value to be stored under a certain header is 9999, the quantity 12 would have to be entered as 0012 in order for the sorting algorithm to perform properly. If this constraint is too troublesome, numeric values may still be sorted using the original, slower sort routine in File Cabinet—simply answer in the negative to the question presented by statement number 1506.☐

```
1032  PRINT D$"BLOAD AMPERSORT"
1035  HIMEM : 37888 : POKE 1015,148
1040  POKE 1013,76 : POKE 1014,0

DEL 1260,1280

1502  IF L=1 THEN &SRT#(N$,0,NR,0,S,1,255,A) : GOTO 1420
1504  IF L<>2 THEN 1500
1056  PRINT : PRINT "WERE ALL NUMBERS" :
      INPUT "ENTERED WITH LEADING ZEROS (Y/N)?";L$ :
      IF L$="Y" THEN L=1 : GOTO 1502
1520  CALL-3288 : REM *** CREATE HEADER FILE ***
2610  CALL-3288
2830  CALL-3288 : PRINT D$ "DELETE" DB$" RPTFMTNAMEFILE"
4070  CALL-3288 : HOME : PRINT "NO REPORT FORMATS ON DISK..." : PRINT
4830  CALL-3288:
4990  PRINT "6 SORT (NUMERIC MAY TAKE" INT(.0005 * NR^2 + .03 * NR)
            "MIN.)"

DEL 5180, 5210
SAVE FILE CABINET &
```

For an Applesoft RAM system, change the CALL's in statements 1520 to 4830 to reference +11055. Change statement 1035 to:

```
1035 HIMEM : 21504 : POKE 1015,84
```

Figure 1. Modifications to File Cabinet.

```
]MAXFILES1
]CALL-151
*200.2000R       (load Amersort II from tape)
 (press RESET)
*A12:44
*840:54
*847:94
*861:B6
*C13:54
*C1A:94
*800G            (relocate Ampersort II)
   .
   .              Answer questions asked by the relocate program
   .
*9DBFG           (Restore DOS and Applesoft)
]BSAVE  AMPERSORT,A$9400,L$600
]PR#6
]RUN  FILE CABINET &
```

For a 32K system, modify the above BSAVE command as follows:

```
]BSAVE AMPERSORT,A$5400,L$600
```

Figure 2. Dialogue for saving Ampersort II on disk.

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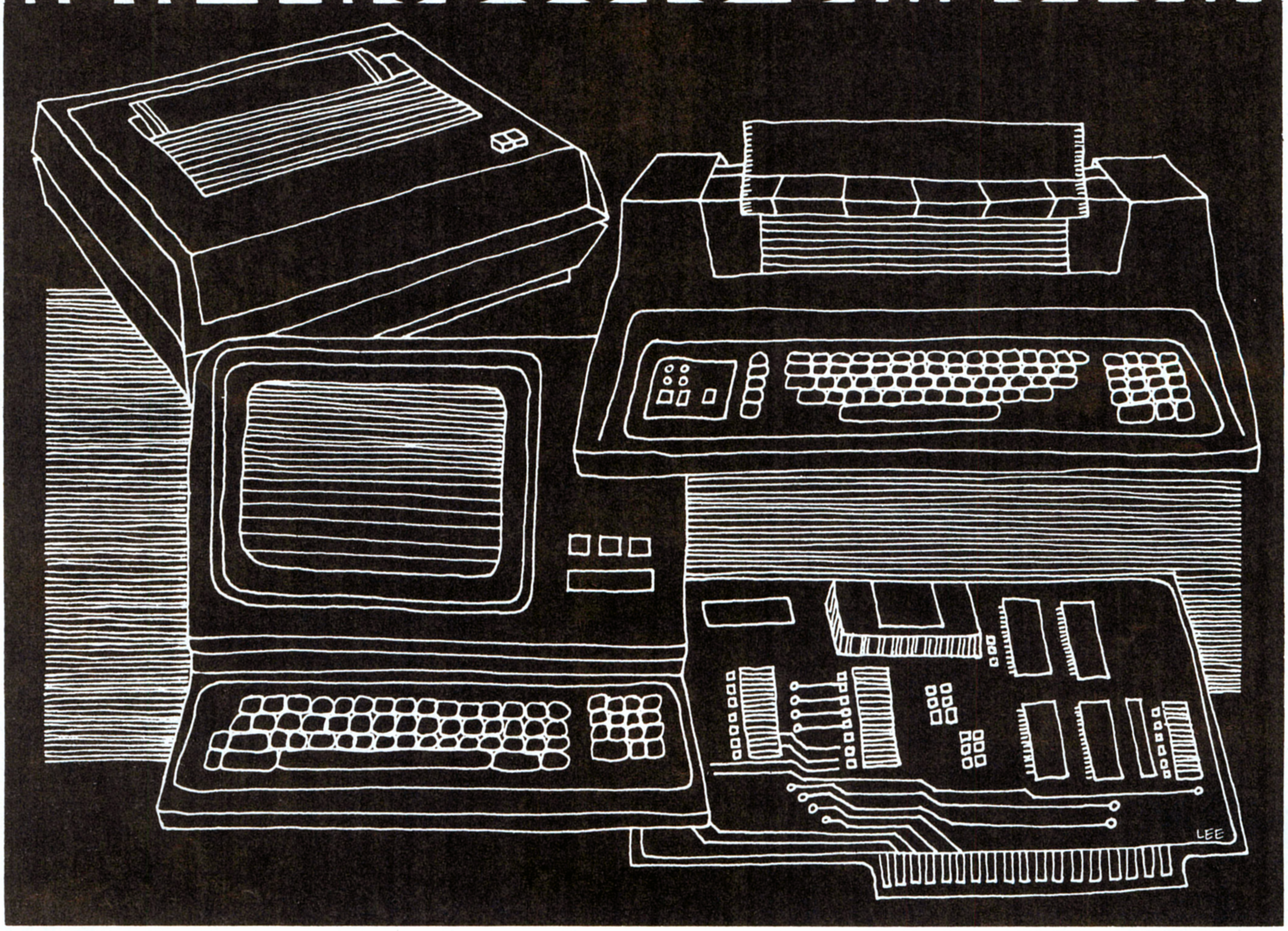

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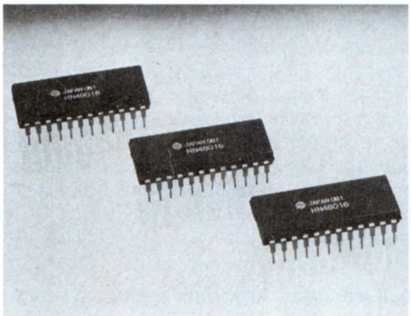

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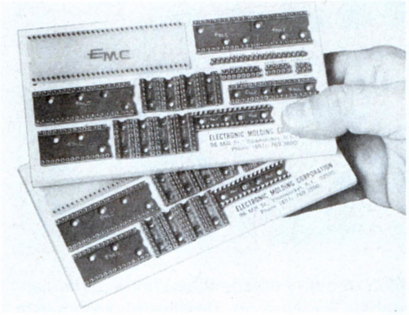

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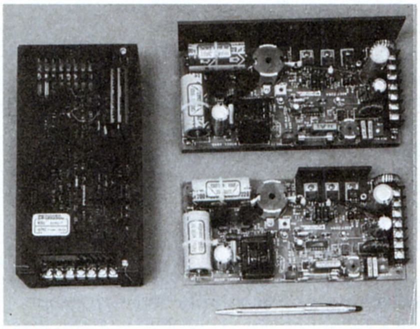

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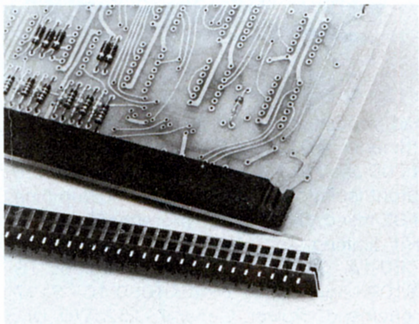

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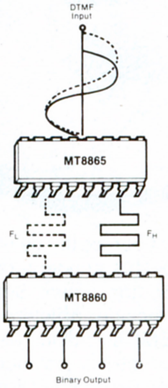

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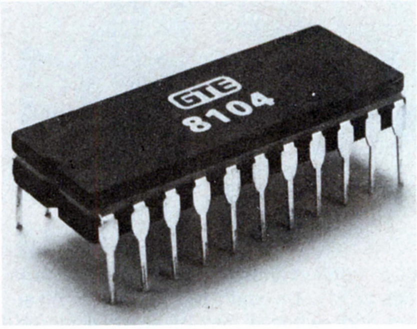
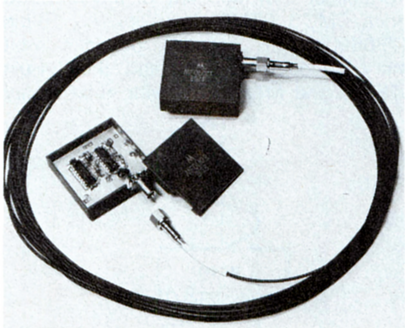
Two 8K RAMs reduce power consumption and operate efficiently in both the enabled and disabled mode. The 8104 and the 8114 are organized as 1024-word by 8-bit configurations and have access times of 200, 300 and 400 nanoseconds. In the enabled mode, both devices typically use 125 milliwatts of power. In the disabled mode the devices typically use 25 milliwatts of power. The RAMs have common data input/output pins for connection to a common data bus.

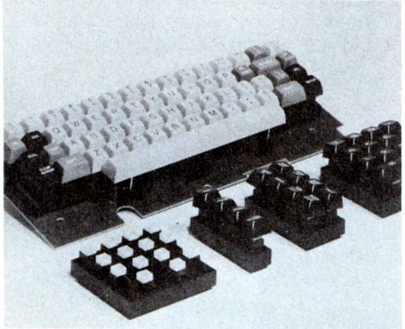


Both have a delatched write function and data-in can be controlled by the write enable function for a "delayed write" capability. Each requires a +5 volt power supply. The devices also can be used during software development. The 8104 can be used to improve turnaround time and the 8114 can help make program erasing and reprogramming unnecessary. GTE Microcircuits, 2000 W. 14th St., Tempe, AZ 85281, (602) 968-4431.
CIRCLE INQUIRY NO. 132

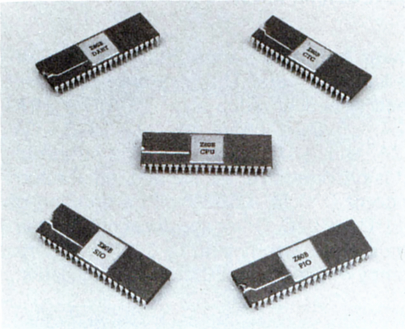
Fiber optic evaluation kit, Link II, provides TTL transmitter and receiver modules that permit installation of a simplex link in excess of 1000 meters. The component contents of the kit are: a transmitter module, a receiver module, and 10 meters of fiber cable, preterminated with appropriate matching AMP connectors, to demonstrate fiber optics capabilities. The kit features the combination of ferrule fiber optic semiconductors and AMP compatible connectors, offering a fiber optic connector system. Some features of this system include: efficient die to fiber coupling, RFI/EMI shielding, elimination of ground loops, electrical isolation, noise immunity and requires no optical expertise. Price for the kit, in unit quantities, is $124.99. Motorola, P.O. Box 20912, Phoenix, AZ 85036, (602) 244-4556.
CIRCLE INQUIRY NO. 133



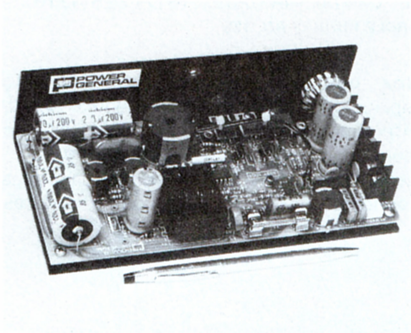
Keyswitch KS-200 is available in molded monolithic array housings and also discrete versions. These mechanical keyswitches feature twin bifurcated precious metal contacts, insuring 20 million cycle life for the momentary switches and 5 million cycles for the alternate-action switches. They are offered in arrays ranging from standard 54-and 63-key layouts, as well as custom multi-key units to ancillary arrays of 2 × 1 through 6 × 5 configurations to standard numeric pads in 11-, 14- and 18-key formats. All arrays and switches can be wave soldered. Because each unit is made to user specification, pricing must be quoted for each application. Stackpole Components Co., Box M, Farmville, VA 23901, (804) 392-4111.
CIRCLE INQUIRY NO. 134



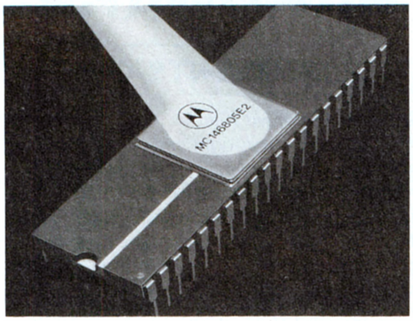
Z80 peripheral circuits in high-speed versions will enable users to upgrade existing systems and design new high-performance systems. The units run at a clock rate of 6.0 MHz, compared to 2.5- and 4.0-MHz rates of earlier versions. They are designed to work in conjunction with the 6.0-MHz Z80B CPU. The peripherals come in plastic packages and operate over a temperature range of 0°C to +70°C. In 10-99 quantities, they are priced as follows: Z8420B PS (Z80B PIO), $13.67; Z8430B PS (Z80B CTC), $13.67; Z8440B PS (Z80B SIO), $40.67; Z8470B PS (Z80B DART), $21.44. Zilog, 10340 Bubb Rd., Cupertino, CA 95014, (408) 446-4666.
CIRCLE INQUIRY NO. 135



Switching power supply series 1060 provides output power of 5VDC@12A and may be adjusted from 4.5VDC to 5VDC. Full rated output is provided over an ambient temperature range of 0°C to 50°C with a 2%/°C derating to 71°C. The units incorporate the half bridge configuration to do the switching. This scheme achieves an efficiency of 80%, plus very low output ripple and noise. Ripple and noise measures 50 mV P-P or 10 mV RMS. Other specifications include: line and load regulation, ±0.1%; temperature coefficient, ±0.02%/°C; transient response of 200 μsec to 1% of the final value; input to output isolation, 250VAC; and a holdup time of 32 msec. Overvoltage protection and current limiting are standard. Prices: Model 1060-1A - $105 - PC board, Model 1060-1B - $109 - open frame, Model 1060-1C - $117 - enclosed. Power General, 152 Will Dr., Canton, MA 02021, (617) 828-6216.
CIRCLE INQUIRY NO. 136



8-bit CMOS microprocessor, MC146805E2, has 61 basic instructions similar to the MC6800 microprocessor, plus a complete set of bit-manipulation instructions to allow any bit in RAM or any I/O pin to be individually set or cleared with a single instruction. The low power requirement, 20 milliwatts at 1 MHz and less than 1 milliwatt in standby, makes the part attractive for applications where power is a major consideration. The voltage range is 3 to 6 volts. On-chip functions include an 8-bit timer with software programmable 7-bit prescaler, 112 bytes of RAM, and a clock generator. The multiplexed bus has an 8K byte addressing range. Available in 40-pin cerdip or plastic packages. Price: $45 in unit quantities (plastic). Motorola Semiconductor Products, 3501 Ed Bluestein Blvd., Austin, TX 78721.
CIRCLE INQUIRY NO. 137



Ascii encoded keyboards with asynchronous serial output, the VP-606 with a 58-key typewriter format and the VP-616 with an additional 16-key calculator-type keypad are suitable for demanding environments. The units incorporate high-technology, flexible-membrane key switches with a light positive activation pressure. Contact life is rated at greater than 5 million operations. A finger-positioning overlay combined with positive keypress action gives good operator feel, and an on-board tone generator gives aural keypress feedback. The unitized keyboard surface, impervious to liquids or dust particles, combined with high-noise-immunity CMOS circuitry makes these units particularly suitable for use in hostile environments. Three separate asynchronous communication modes are provided: EIA RS232C compatible, 20 mA current loop, and TTL. VP-600 series keyboards, operable from a single +5 volt supply, and including such features as switch-selectable 128-character or 102-character upper case only alphanumerics, 2-key rollover circuitry and an LED power-on indicator, are suitable for a wide variety of demanding industrial and consumer applications. Price: $65. Microcomputer Products Marketing, RCA, New Holland Ave., Lancaster, PA 17604, (717) 697-7661.
CIRCLE INQUIRY NO. 138

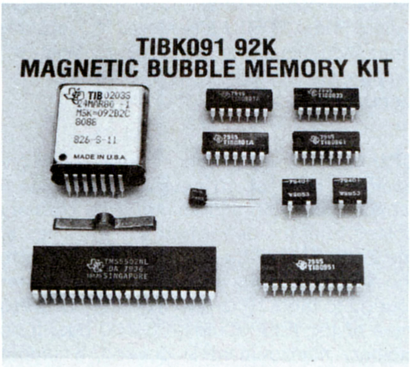
Octal transceiver integrated circuit with twice as much drive capability as its predecessors, the SN74LS645-1, is designed for asynchronous two-way communication between data buses, is rated at an output sinking current (I_{OL}) of 48 milliamperes, giving it greater drive capability in both directions. The high-drive is a dual 8-bit 3-state buffer back-to-back in a 20-pin Skinnydip. A single device can replace two quad transceivers or two octal buffers, thus taking up only half as much board space as its equivalent in unidirectional buffers. Monolithic Memories, 1165 E. Arques Ave., Sunnyvale, CA 94086, (408) 739-3535.

CIRCLE INQUIRY NO. 139

Fiber optic cable series 2270 with graded-index utilizes a core diameter of 50 micrometers with a cladding diameter of 125 micrometers is designed to comply with proposed worldwide standards. Bandwidth is 200 MHz-km, and nominal attenuation is 8 db max. at 850 nanometers. Numerical aperture is 0.21. Available in standard cable configurations of 1, 2, 6, 12, and 18 fibers, the series is recommended for applications requiring wide bandwidth over long distances. The cable design features Corning optical fibers, with a nominal coated outer diameter of 250 micrometers, enclosed in plastic buffer tubes and reinforced by jacketed or braided Kevlar strength members, depending on the configuration. Cables utilizing 6 or more fibers have the blue PVC exterior jacket augmented by a rip cord to aid stripping and termination. Price ranges from $1.10-$1.34 per meter in quantities less than 10 km. Belden Corp., 2000 S. Batavia Ave., Geneva, IL 60134.

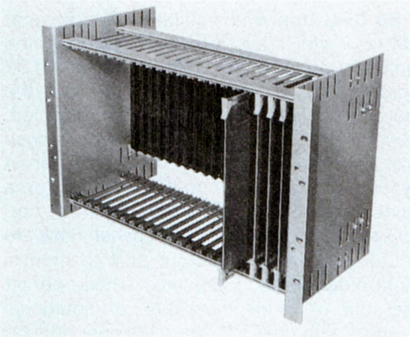
CIRCLE INQUIRY NO. 140

Magnetic bubble memory kits TIBK090 and TIBK091, provide magnetic bubble memory and custom integrated circuits required to layout and assemble a complete 92K-bit bubble memory system. The TIBK091 kit contains the parts required to construct one minimum memory systems, and consists of: one TIB0203S 92K-bit bubble memory; one TIB0833 sense amplifier; two TIB0801A coil drivers; one TIB0861 function driver; two VSB53 diode arrays, one TSP102G thermistor, one TIB0951 function-timing generator, and one TIB0901 controller. The TIBK090 kit contains all of the parts required to construct one modular-memory unit (MMU). The MMU consists of all the parts in the TIBK091 kit except the function-timing generator and controllers. Each TIB0951 function-timing generator and TIB091 controller pair will drive up to ten modular memory units each containing one TIB0203S bubble memory. Thus the memory capability of the TIBK091 kit can be expanded readily by assembling additional TIBK090 kits and utilizing the timing generator and controller capabilities provided by the TIBK091 kit. The TIB0203 bubble memory device provides 92K bits of non-volatile memory, 50K-bits per second data transfer rate, and an average access time of 4 milliseconds. It occupies less than 1.25 inches square (8 centimeters square) of board space. Prices: TIBK090, $151; TIB091, $191. Texas Instruments, P.O. Box 225012, M/S 308, (Attn: TIBK090), Dallas, TX 75265.



CIRCLE INQUIRY NO. 141

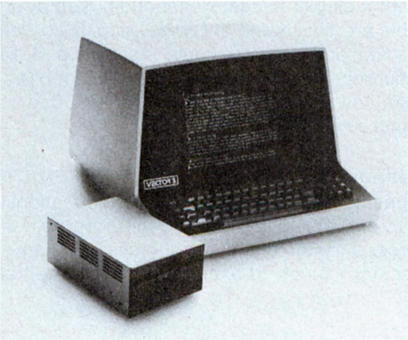
Rack-mounted card cages, the CCK100, hold 21 S-100 bus cards on ¾-in centers for packaging micro systems. Fabricated of 0.081-in clear anodized aluminum sidewalls (14 gauge) and extruded aluminum cross members, a cage measures 19 by 12 by 9 inches. Adjustable cross members accommodate circuit boards ranging from 4 to 8 inches long and from 10 to 11.5-in wide. Vector Electronic Co., Inc., 12460 Gladstone Ave., Sylmar, CA 91342, (213) 365-9661.



CIRCLE INQUIRY NO. 142

COMPUTER SYSTEMS

Upgradable entry level computer system, VIP, offers a 315 KB mini-diskette drive, existing software from other Vector systems, the ability to upgrade to those systems, a video console with built-in computer electronics, and a separately housed modular disk drive. The drive can be supplemented by up to three identical drives or replaced by a 2-megabyte diskette unit or by a 32-megabyte Winchester. This results in dealer support cost savings as well as security for the end user. The system offers true word processing, business accounting, data management and communications software. Hardware includes a 6-slot industry standard S-100 bus; 4 mHz Z80A processor; 56K of user dynamic RAM; a serial RS-232 port; programmable parallel ports; 80 × 24 character memory-mapped video display with 8 × 10 character matrix; and a typewriter style keyboard layout with a separate numeric key pad and capacitance keys. Price is $3,695. Vector Graphic, Inc., 31364 Via Colinas, Westlake Village, CA 91362, (213) 991-2302.



CIRCLE INQUIRY NO. 147

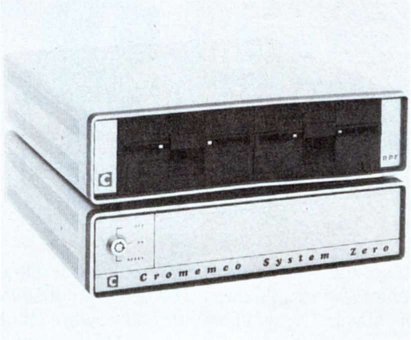
Multi-user computer system, the System 8020, featuring high performance, low cost and generous expansion capability has three microprocessor modules, four independent user terminals, 20Mb of fast disk storage, a standard 8-in floppy disk drive for software interchange and a fast cartridge tape backup device. The system is based on the Z80 microprocessor and features the industry standard operating system environment which makes available a wide variety of applications software. Throughput is enhanced by the fact that the processors operate at a clock rate of 6mHz. User terminals feature a human-engineered detatched keyboard and a 15-in video display containing over 3000 software-definable characters and graphics. Price is $60,000. Echo Communications Corp., 1708 Stierlin Rd., Mountain View, CA 94043, (800) 227-8420.

CIRCLE INQUIRY NO. 148

108K byte micro has a floppy disk capacity of 4.8 megabytes. The design provides the user with bank-selected memory to allow larger address space. For instance, both the 16K high resolution graphics buffers and the 16K disk buffers are bank-selected, thus not appearing in the address space. The user has the choice of dual 5¼-in mini-floppy drives that have an 800K disk capacity or dual 8-in drives that provide 2.4 megabytes of disk storage capacity. The chaining of two dual 8-in disk drive units, which is permitted by the disk controller, gives the system a total disk capacity of 4.8 megabytes. The operating system reads a full disk track at a time, as opposed to the sector-by-sector approach. This results in a data transfer rate of 15,000 characters per second. Computhink, 965 W. Maude Ave., Sunnyvale, CA 94086, (408) 245-4033.

CIRCLE INQUIRY NO. 149

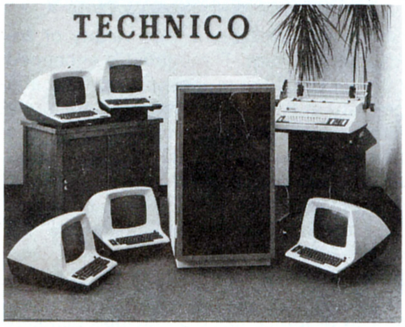
S-100 bus computer system, the System Zero, is suited to applications in engineering, science, medicine and professional fields such as education and business. The system is provided with a Z80-based single card computer, 1K of RAM, and 3K Control Basic in ROM. An additional three slots on the



S-100 bus are available for tailoring the system to individual requirements. The system can be expanded by adding additional memory and I/O cards to handle floppy and/or hard disk systems. Currently available software includes RPG II, Fortran, Cobol, 32K Structured Basic, 16K Basic, Lisp, word processing, data base management, business application software, and sophisticated disk operating systems. Cromemco, Inc., 280 Bernardo Ave., Mountain View, CA 94043, (415) 964-7400.

CIRCLE INQUIRY NO. 150

Advanced multiprocessor system, T.I. 32, incorporating two Texas Instruments 9900 16-bit microprocessors, is available in a 6-slot desktop version and a 10-slot cabinet chassis, has a ROM-based operating system supporting six work stations expandable later to 18 work stations. Storage options include double sided floppys, 3M cartridge, 8 or 14-in Winchester hard disk. The user memory is expandable to 192K total in increments of 2K to 32K. Business application packages include a multi-journal, multi-division, multi-profit center general ledger package; a payroll/personnel package; receivables; payables; inventory; and mailing list and data base management. Prices range from $8,999 to $19,999. Technico, Inc., 9051 Red Branch Rd., Columbia, MD 21045, (301) 995-1995.



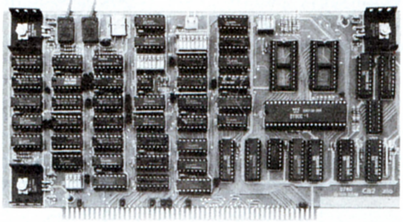
CIRCLE INQUIRY NO. 151

Project information management system Vision, integrates project schedules, resources and costs to provide management with plotted graphics, printed tabular reports and CRT displays that are instantly available and easy to read. It is ideal for project planning, scheduling, monitoring and cost control in a wide variety of industries and applications. It has been designed to eliminate the large computer bottleneck and allow remote site application. The system consists of advanced minicomputer hardware that provides fast response via CRT terminals, printers and plotters. A variety of hardware configurations are available to meet specific and growing user needs. The user works in plain English. The CRT terminal interactively guides the user with preformatted displays. The user can: develop project plans and schedules; monitor, control and update information; do cost analysis and resource allocation; perform "what if" simulations; and produce networks, barcharts and X-Y graphs. Systonetics, Inc., 600 N. Euclid St., Anaheim, CA 92801, (714) 778-1600.

CIRCLE INQUIRY NO. 152

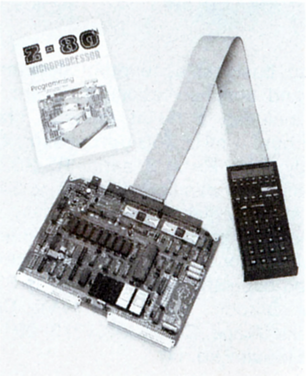
CPU/MEMORY

Z-80 CPU board is capable of operating at 2MHz or 4MHz by dip switch selection and includes sockets for two 2716 or 2732 Eproms or HM6116 2K RAMs. If desired, the memory sockets can be enabled or disabled. Separate run/stop and single/step switches are also included on the board to permit system evaluation without the need for a front panel. The unit also features 'mwrite' for use with or without a front panel, firmware vector jump and an output port to control eight extended address lines. These permit the use of more than 64K of additional memory with the CPU board. Jumper options on the board will also generate the industry's new proposed IEEE S-100 signals. User selectable options through onboard switches and wire-wrap jumpers include a 2 to 4 MHz CPU-clock dynamic speed change under the control of the XRDY/PRDY/RUN signals and one wait state if needed on each M1 cycle. The board will emulate 8080 I/O addressing and is provided with an 8-bit output port which can be used as extended addressing with a simple header connection. Also available are phase one of STVAL signals as well as NMI and refresh signals capabilities. SSM Microcomputer Products, 2190 Paragon Dr., San Jose, CA 95131, (408) 946-7400.



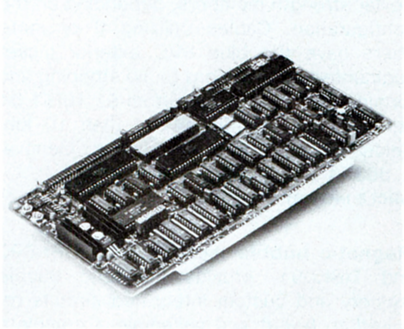
CIRCLE INQUIRY NO. 154

Nanocomputer package, NBZ80, is specifically designed as an educational system, complemented by three books (on programming, digital electronics and interfacing) conceived and written as an integral part of the system. The Nanocomputer range includes several complete ready-to-go packages containing hardware, software, books and technical manuals. All boards are tested to ensure maximum reliability. No previous experience is needed to teach or learn with the unit, and for the non-specialist the system reliability is an important feature. Price: $839. SGS-ATES Semiconductor Corp., 240 Bear Hill Rd., Waltham, MA 02154, (617) 890-6688.



CIRCLE INQUIRY NO. 155

S-100 compatible CPU board model CPD-280, a Z80A based, second generation processor board is designed specifically for the S-100 computer bus. It offers the user 4 MHz operation and advanced features that are optimized for multi-user systems. Eight vectored priority interrupts allow the central processor to maximize its executable time by eliminating the need for polling. A real time clock generates the interrupts required by the available multi-user operating systems. Two serial and two parallel ports are optimized for high speed data transfer by utilizing direct memory access. In addition, hardware interfaces are customed through use of external personality boards. All functions are performed by complex LSI chips, allowing the user tremendous flexibility in programming the exact options required for system application. Price: $750. Larry Malakoff, Measurement Systems & Controls, 867 N. Main St., Orange, CA 92668, (714) 633-4460.



CIRCLE INQUIRY NO. 156

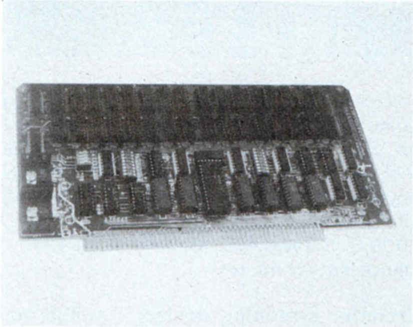
CPU board for S-100 consists of a fast onboard memory of 16 bytes, which holds a table. The 4-bit address of this memory comes from the upper four address lines of the Z-80. Four of the eight output lines go to the A12 to A15 bus address lines. The other four go to the A16 to A19 extended address lines of the IEEE standard S-100 bus. If no memory management is desired, a jumper block may be inserted in place of each of the two memory IC's. The on-board table memory may be loaded by the programmer or system software with I/O commands. The board is especially designed to make it easier to implement multi-user operating systems, such as MP/M. Price: $450. Tarbell Electronics, 950 Dovlen Pl., Suite B, Carson, CA 90746, (213) 538-4251.

CIRCLE INQUIRY NO. 157

Printer/memory expansion module for TRS-80 can add 16K or 32K or dynamic RAM to the user's basic 16K machine without the expense of a full-blown expansion interface. The module also contains circuitry to drive any Centronics-compatible printer. The module is housed in a grey and black aluminum case, 3 × 7 × 16.5 inches, that sits under the CRT and is available in three configurations, all assembled and tested: The MT-32A, with no RAM @ $99.50, the MT-32B, with 16K RAM @ $159.50, or the MT-32C, with 32K RAM @ $199.50. Microtek, Inc., 9514 Chesapeake Dr., San Diego, CA 92123, (800) 841-1081.

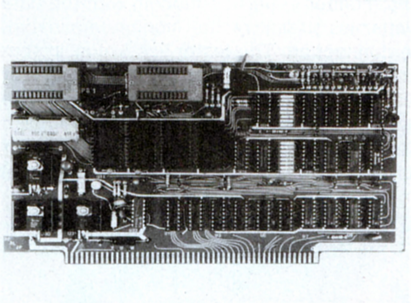
CIRCLE INQUIRY NO. 158

Expandable board works with most Z-80 CPU boards including Cromemco Systems (ZPU-64K), S.D. Systems (SBC 100, 200 and Z-80 starter kit), SSM (CB2A), Jade (Big Z), Q T (SBC + 2/4), Ithaca Audio and North Star. The typical access time using 4116/200ns/4MHz is 240ns. With the 4116/150ns/6MHz, the access time drops to 200ns. The Expandable + is available as a bare board, kit or assembled and tested unit. It supports 16K, 32K, 48K or 64K of memory. It uses a 3242 refresh chip with delay line, as well as a Z-80 refresh signal. It has a low power consumption of 4 watts. Other features include: 24 address lines per IEEE specifications; optional M1 wait state allows error-free operation with faster processors; bank on/off signal selected by I/O port 40 (Hex) per industry standard; bank in use determined by convenient dip switch selection of data bus bits. Prices range from $70 for the bare board and manual to $625 for the 64K assembled and tested unit. Q T Computer Systems, Inc., 15620 S. Inglewood Ave., Lawndale, CA 90260, (213) 970-0952.



CIRCLE INQUIRY NO. 159

Dual-service board, PB1, combines programming and memory capabilities. Since the board is equipped with Textool sockets, after programming a 2708 or 2716 Eprom the Eprom doesn't have to be pried from the PB1 board. Four sockets which can be used to hold 2708 or 2716 Eproms are also included. Since the unused Eprom sockets don't take up vital memory space, the user is never committed to the full 4K or 8K of memory. Two separate programming circuits are featured so 2708 or 2716 (5V) type Eproms can be programmed without modifying the board. The programming voltage is generated on-board so there is no need for an additional or external power supply. All programming sockets are dipswitch addressable to any 4K boundary. Complete software is also provided for programming and verifying Eproms bit for bit. SSM Microcomputer Products, 2190 Paragon Dr., San Jose, CA 95131, (408) 946-7400.

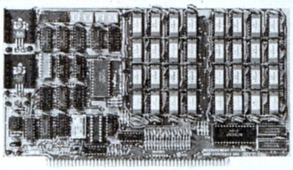


CIRCLE INQUIRY NO. 160

12K Eprom, ROM, RAM memory module runs in any Apple slot and will hold up to six (2716 Eproms, 2316E ROMs or TMS 4016 RAMs). All switching of the type and number of devices used is controlled by on-board dip switches. The board is double sided, with plated through holes, solder masked, and has gold plated connector fingers for reliability. This board used in conjunction with Microproducts' 6502 development system software package, and Eprom programmer, make a powerful set of tools for the development of 6502 assembly language code. Price is $99.95. Microproducts, 30420 Via Rivera, Rancho Palos Verdes, CA 90274, (213) 541-5131.

CIRCLE INQUIRY NO. 161

S-100 error-correcting board monitors the user's existing system RAM/ROM via the bus signals, intervening to correct erroneous bus data before it reaches the CPU. The board corrects all 1-bit memory errors and flags all 1-bit or 2-bit errors, increasing system memory reliability by 80 times or more. All operations are performed through on-board hardware - no system software or hardware changes are required. Operating to 4 MHz, this board monitors 64K of memory. Compatible with most static and dynamic memories. Applications: wherever a computer



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- ★ MEMORY BOARD EDGE CONNECTOR PLUGS INTO THE 6800 S 44 BUS.
- ★ CONNECTS TO PET OR KIM USING AN ADAPTOR CABLE.
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- ★ USES +5V ONLY, SUPPLIED FROM HOST COMPUTER.
- ★ FULL DOCUMENTATION. ASSEMBLED AND TESTED BOARDS ARE GUARANTEED FOR ONE YEAR AND PURCHASE PRICE IS FULLY REFUNDABLE IF BOARD IS RETURNED UNDAMAGED WITHIN 14 DAYS.

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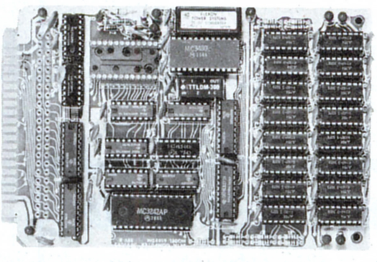
HARD TO GET PARTS (NO RAM CHIPS) WITH BOARD AND MANUAL		$109.00
BARE BOARD & MANUAL		$49.00



PET INTERFACE KIT—CONNECTS THE 32K RAM BOARD TO A 4K OR 8K PET. CONTAINS: INTERFACE CABLE, BOARD STANDOFFS, POWER SUPPLY MODIFICATION KIT AND COMPLETE INSTRUCTIONS. **$49.00**

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Hardware Requirements

An Apple II computer with 48K of RAM, two Apple II disk units, 40 character by 24 line screen, 132-column printer, language card, and the Z-80 Softcard from Microsoft. The Softcard converts the Apple II into a CP/M-compatible system.

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Apple II Plus 48K	1,116
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Disk II	449
Language System	439
Softcard - Microsoft	325

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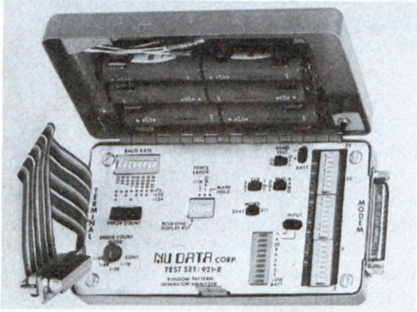
CIRCLE INQUIRY NO. 82

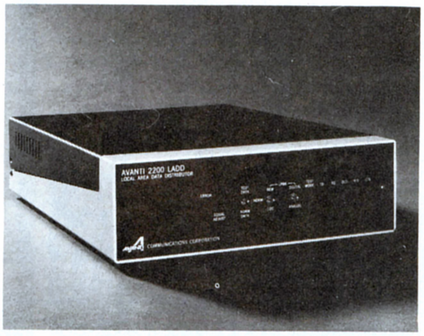
error is expensive - process control, financial applications, etc. Also useful for a "quick fix/diagnosis" of a system with a memory problem - plugging in this board will correct the problem, and latched displays identify the specific address and bit in error. Correlation Systems, 81 Rockinghorse Rd., Rancho Palos Verdes, CA 90274, (213) 833-3462.
CIRCLE INQUIRY NO. 162

DATA COMMUNICATIONS

Random pattern generator/analyzer EIA interface tester, model 921R, is designed for field use, installs between data terminal and data communications equipment to test and monitor either the modem with the data transmission link or the modem/terminal interconnection. The tester has two main sections: a random pattern generator/analyzer and an EIA interface monitor/tester. The generator/analyzer includes crystal controlled speeds, selectable from 75 to 19.2K bps for asynchronous operation plus an external clock for synchronous transmission: The EIA interface monitor/tester enables direct access to all 25 leads and these can be disconnected or cross connected to any terminal by cord patching or independent switching, excluding frame ground. Price is $495. Nu Data Corp., 32 Fairview Ave., Little Silver, NJ 07729, (201) 842-5757.
CIRCLE INQUIRY NO. 164

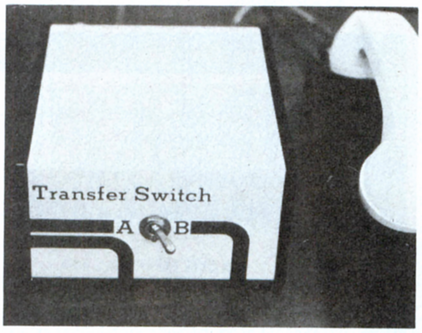


Local area data distributor, Avanti 2200, a synchronous line driver available with an asynchronous option, is designed for high speed transmission of digital data. It operates over unloaded lines or coaxial cables at distances up to 10 miles. Standard switch selectable speeds are 1.2, 1.8, 2.4, 3.6, 4.8, 7.2, 9.6 and 19.2 Kbps for both synchronous and asynchronous operation. With the high speed synchronous option, the rates are 2.4, 4.8, 9.6, 19.2, 48, 50, 56 and 64 Kbps. The driver is available in a desktop stand-alone or rack mount configuration, or as rack mount modules whereby 10 modules and associated power supply are housed in a single prewired rack assembly. Price is $795. Avanti Communications Corp., Aquidneck Industrial Park, Newport, RI 02840, (401) 849-4660.
CIRCLE INQUIRY NO. 165

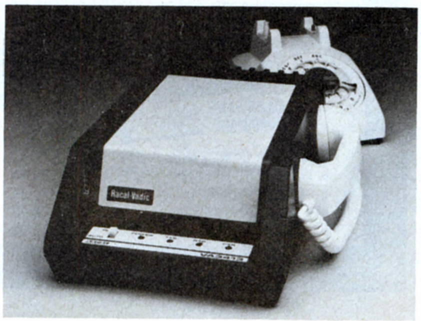


Short-haul modem for stand-alone metallic data transmission links, the Bit-Driver, provides asynchronous simplex and duplex data transmission at speeds from dc to 56K bps. The metallic-conductor unit is recommended for use in clean electrical environments. Depending upon the type of shielded and unshielded two-pair cable selected, operating range extends from 1500 to 4500 m (5,000 to 15,000 ft.) Used in pairs, the modems replace conventional telephone company equipment, eliminating equipment leasing and associated line charges. Belden Corp., 2000 S. Batavia Ave., Geneva, IL 60134.
CIRCLE INQUIRY NO. 166

Transfer switching device, T-switch, for easy port switching between CPUs, modems and terminals and a free null modem for circuit compatibility, permits the user to switch two 24-signal lines without undertaking the costly process of switching all cables. The switch has three A-800 series 25-pin female connectors. Pin one, common to all connectors, is used as system ground and is not switched. The other 24 pins permit the transfer of 24 digital data lines between devices. Price is $175. Inmac, Dept. 1025, 2465 Augustine Dr., Santa Clara, CA 95051.
CIRCLE INQUIRY NO. 167



Dual acoustic coupler provides both 1200 bps and 0 to 300 pbs full duplex operation



and is compatible with VA3400 and 103/113 type modems. Coupler satisfies in one portable unit almost all originate applications for full duplex 1200 bps and 0 to 300 bps data transmission over the 2-wire switched network. To simplify operation, the coupler, under microprocessor control, employs a unique scheme for automatic detection of the called modem, making it unnecessary for the user to have to manually select the VA3400 or 103 mode. An automatic 9 or 10-bit character length recognition in the VA3400 mode simplifies operation since the user can communicate with either 9-bit (primarily IBM) or 10-bit systems without physical changes to the modem. Price is $895. Racal-Vadic, 222 Caspian Dr., Sunnyvale, CA 94086, (408) 744-0800.

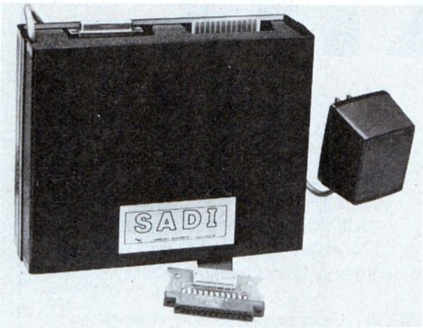
CIRCLE INQUIRY NO. 168

Z-net local computer network designed for multiuser business and specialized data interconnect applications has a low-cost method of interconnecting diverse types of data equipment. It provides an efficient new tool for commercial small business environments with Cobol-oriented multiuser needs such as inventory control and order entry. The system architecture concept involves a single-channel, packet-switched, local computer network with fully distributed control. Transmission facilities (i.e., cable, transceiver and "T" tap) support a network of up to 255 stations. These stations can be arranged along the network in any combination. And they can be deployed wherever needed (at various desks, offices, floors, even in different buildings) along a total cable length of nearly 2 miles. Zilog, 10340 Bubb Rd., Cupertino, CA 95014, (408) 446-4666.

CIRCLE INQUIRY NO. 169

INPUT/OUTPUT

Two-way interface for Pet, Sadi is an RS-232 and parallel output device. It allows connection of a Pet to parallel and serial printers, CRTs, modems, acoustic couplers, hard copy terminals, and other computers. Independent serial and parallel ports allow communication with both peripheral devices simultaneously or individually. The unit also allows the transferring of programs between Pet computers. Special features include conversion to true Ascii both in and out, cursor controls and function characters specially printed, selectable reversal of upper and lower case, Pet IEEE connector for daisy chaining, and addressability for use with other devices. The parallel interface provides both data strobe and device ready in either polarity, plus centronics printer compatibility. Each interface comes complete with power supply, Pet IEEE cable, RS-232 connector, parallel port connector, and case. Price: $295. Sadi, Connecticut Microcomputer, 34 Del Mar Dr., Brookfield, CT 06804.



CIRCLE INQUIRY NO. 172

Multi-function peripheral Housemaster makes possible a variety of applications for device control and general entertainment. It is designed for operation with Digital Group computers. Included are: a real-time 24-hour clock/calendar; voice recognition; two AY-3-8910 sound generators; Sears/BSR home controller interface; home control program; 15 additional programs; complete operational manuals and instructions. Applications include: voice/time control of your computer, lights and appliances; a clock that chimes the time on voice request; music generation; monaural or stereo sound effects; voice interactive game programs; voice interactive computer aided instruction. Artra, Inc., Box 653, Arlington, VA 22216.

CIRCLE INQUIRY NO. 173

RACET COMPUTES
702 Palmdale, Orange CA 92665

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★★ NEW ★★ BASIC LINK FACILITY 'BLINK' **$25 Mod I**
(Mod I Min 32K 1-disk) **$50 Mod II**
Link from one BASIC program to another saving all variables! The new program can be smaller or larger than the original program in memory. The chained program may either replace the original program, or can be **merged** by statement number. The statement number where the chained program execution is to begin may be specified!

INFINITE BASIC (Mod I Tape or Disk) **$49.95**
Extends Level II BASIC with complete MATRIX functions and 50 more string functions. Includes RACET machine language sorts! Sort 1000 elements in 9 seconds!! Select only functions you want to optimize memory usage.

INFINITE BUSINESS (Requires Infinite BASIC) **$29.95**
Complete printer pagination controls — auto headers, footers, page numbers. Packed decimal arithmetic — 127 digit accuracy +, −, *, /. Binary search of sorted and unsorted arrays. Hash codes.

BASIC CROSS REFERENCE UTILITY (Mod II 64K) **$50.00**
SEEK and FIND functions for Variables, Line Numbers, Strings, Keywords. 'All' options available for line numbers and variables. Load from BASIC — Call with 'CTRL'R. Output to screen or printer!

DSM **$75.00 Mod I, $150.00 Mod II**
(Mod I Min 32K 2-drive system. Mod II 64K 1-drive)
Disk Sort/Merge for RANDOM files. All machine language stand-alone package for sorting speed. Establish sort specification in simple BASIC command File. Execute from DOS. Only operator action to sort is to change diskettes when requested! Handles multiple diskette files! Super fast sort times — improved disk I/O times make this the fastest Disk Sort/Merge available on Mod I or Mod II.

UTILITY PACKAGE (Mod II 64K) **$150.00**
Important enhancements to the Mod II. The file recovery capabilities alone will pay for the package in even one application! Fully documented in 124 page manual! XHIT, XGAT, XCOPY and superzap are used to reconstruct or recover data from bad diskettes! XCOPY provides multi-file copies, 'wild-card' mask select, absolute sector mode and other features. SUPERZAP allows examine/change any sector on diskette include track-0, and absolute disk backup/copy with I/O recovery. DCS builds consolidated directories from multiple diskettes into a single display or listing sorted by disk name or file name plus more. Change Disk ID with DISKID. XCREATE preallocates files and sets 'LOF' to end to speed disk accesses. DEBUGII adds single step, trace, subroutine calling, program looping, dynamic disassembly and more!!

DEVELOPMENT PACKAGE (Mod II 64K) **$125.00**
Includes RACET machine language SUPERZAP, Apparat Disassembler, and Model II interface to the Microsoft 'Editor Assembler Plus' software package including uploading services and patches for Disk I/O. Purchase price includes complete copy of Editor Assembler+ and documentation for Mod I. Assemble directly into memory, MACRO facility, save all or portions of source to disk, dynamic debug facility (ZBUG), extended editor commands.

COMPROC (Mod I — Disk only) **$19.95**
Command Processor. Auto your disk to perform any sequence of instructions that you can give from the keyboard. DIR, FREE, pause, wait for user input, BASIC, NO OF FILES and MEM SIZE, RUN program, respond to input statements, BREAK, return to DOS, etc. Includes lowercase driver, debounce, screenprint!

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firmFORTH is an applications package for use with tFORTH. It provides for recompilation of the tFORTH nucleus, deletion of superfluous code and production of fully rommable code. **$350.00**

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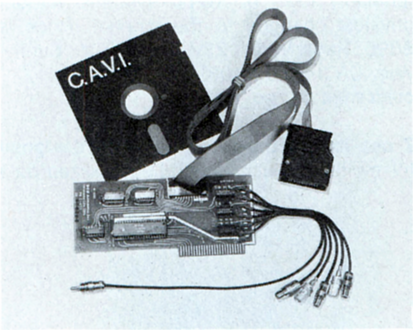
CIRCLE INQUIRY NO. 35

Interactive video interface C.A.V.I. model 400 is a single board video tape controller for Apple II microcomputers. The system hardware/software permits precise video tape positioning by counting pulses from the control track of the tape. The interface contains a video/audio switcher to allow alternate display of computer-generated or taped video on a single monitor. The system will control industrial type VHS, Beta, and ¾ inch video recorder/players. No modifications to the computer or the VTR are required. The unit is especially applicable to interactive video instruction. A student views lesson segments on video tape, then responds to questions asked by the computer. Based on the student's response, the computer will command the video tape player to search for the next appropriate video selection. Existing passive video programs may be easily updated to become interactive. Basic software is included on disk to allow the user to search to the beginning of a video scene and play until the end of that scene. Starting and ending frame numbers of each scene may be saved to the disk for future reference. Price: $495. BCD Assoc., 1216 N. Blackwelder Ave., Oklahoma City, OK 73106, (405) 524-7403.

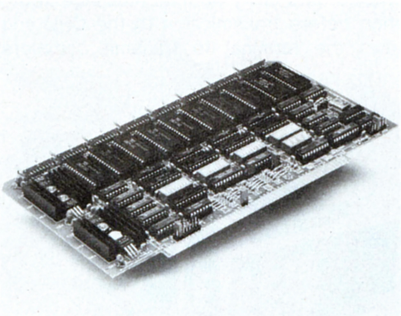


CIRCLE INQUIRY NO. 174

Nine-voice music synthesizer, the ALF/Apple Music II, is a printed circuit board that plugs into an Apple II computer, plus software. The device allows users to compose music with two game paddles (instead of complicated keyboard commands), along with a graphic display of notes and the music staff. Users can select notes on the staff (from a six octave range), and duration and many other characteristics from a menu at the bottom of the screen. During playback of the music, the music is shown on an animated, 16-color display. It has been human engineered for simplicity of use. For example, entering a note duration that is too long for the current measure results in a tied note. Using the keyboard, the user also has control of tempo, key, duration, envelope values and duration, waveform, and length. The user can also edit or save a song, or create a music subroutine for use in another song or another program. The unit is available in cassette or disk versions. Price: $198. Peripherals Plus, 119 Maple Ave., Morristown, NJ 07960, (800) 631-8112.

CIRCLE INQUIRY NO. 175

Multi-user serial I/O board, Ino-288, is designed for use in expanded S-100 systems where up to eight additional serial I/O ports to support terminal and/or printers are desired. The I/O board is available in either a four channel version, expandable to eight channels, or as a full eight channel device. All ports are fully programmable, using the 8251A programmable communication interface. Each port supports RS-232 with full handshaking. I/O ports can operate either asynchronously or synchronously with 16 selectable baud rates. Selection is made through software or dip switches. Measurements Systems & Controls, 867 N. Main St., Orange, CA 92668, (714) 633-4460.



CIRCLE INQUIRY NO. 176

PERIPHERALS

Cartridge tape subsystem is S-100 compatible, providing Winchester disk backup and facilitating off-premises data base storage. The tape interchange package permits transfer of programs and data files from a Winchester disk to an easy-to-handle 13.4MB ¼- inch tape cartridge. Facilitating off-premises data base storage and shipping, the subsystem features comprehensive menu driven software, and links to the Winchester disk under CP/M and MP/M operating systems. Installed by plugging into an S-100 computer system, the package consists of a DS-100 controller, 6400 BPI cartridge tape drive, and rack or table mount power supply. Software is distributed on a single sided, single density 8-inch floppy disk in CP/M format. Prices: $2,100 each (rack mount) and $2,200 each (table mount) in lots of 25. Alloy Engineering Co., Computer Products Div., 85 Speen St., Framingham, MA 01701, (617) 620-1710, TWX 710-380-7624.

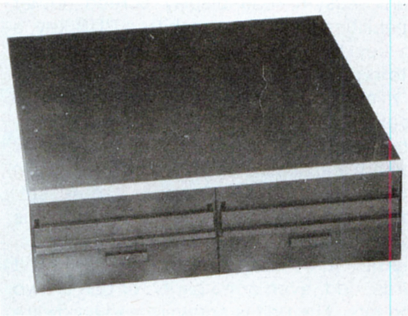
ALLOY
SELECT
RDY
DATA
REWIND

CIRCLE INQUIRY NO. 191

Apple storage increased through the use of 8-inch drives. The SA800 or SA850 is available with power supply, controller, cable and manual read to use. Either configuration is completely software compatible to Apple DOS and Apple Pascal language systems. One SA800 is $1,495, SA850 is $1,695. Minifloppy with interface card is also available for $479. One year warranty parts and labor. Integral Business Systems, 325 E. 48 St., New York, NY 10017, (212) 753-3693.

CIRCLE INQUIRY NO. 192

8-inch disk drive, the MS-800, is compatible with TRS-80 models I and II, Apple II and S-100 systems. The disk drive has a capacity of 77 tracks, 26 sectors per track, 128 bytes per sector—for a total of 256,256 bytes. The data transfer rate is 256,000 bits per second. Also featured is a track-to-track access time of 10 ms. The use of four of these drives, provides a storage capacity of over one million bytes on an Apple or two megabytes on TRS-80 model II. The drives are powered independently of the systems with which they're used. Each drive is completely assembled and tested. Price range of $995-$1,595 includes all hardware (such as controller and CP/M depending on system configuration), software and documentation. Matchless Systems, 18444 S. Broadway, Gardena, CA 90248, (213) 327-1010.



CIRCLE INQUIRY NO. 193

Block-mode CRT display fills a niche between the character-mode HP 2621A and the multi-screen, multi-connection HP 2626A. Advanced editing and formatting features set the HP 2624A terminal apart from others. New editing features are aimed at improving data integrity and increasing system throughput by preventing entry errors; they reduce system overhead by relieving the computer of many data-screening tasks. User-definable, screen-labeled soft keys are featured. Standard memory will store four pages of 80-character lines; five additional pages are optional. Large data-entry forms thus are accommodated, or long listings or programs. The unit offers an optional, built-in thermal printer. An external serial printer port is standard. Display enhancements are standard, including inverse video, half bright, underline, blink and non-display in any combination. Inquiries Manager, Hewlett-Packard Co., 1507 Page Mill Rd., Palo Alto, CA 94304.

CIRCLE INQUIRY NO. 194

Display memory replay CRT, model 14 is a microprocessor-controlled interactive terminal that allows the user to recall up to 7680 characters (the equivalent of four full pages) of previously-displayed data. With trailing-space and line suppression feature, a programmer who is keying in lines of 35-40 characters each, can scroll backward and forward through the previous 200 or more lines of data. The model also features limited block-mode capability. Transmit and print terminator codes—for end of line, end of screen

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PMS is the most comprehensive income property management system developed for a microcomputer. It includes a full general ledger, accounts receivable (tenants), budgeting, checkwriter and many additional features. PMS was designed to meet IREM requirements. Price: $650, demonstration diskette $35.00
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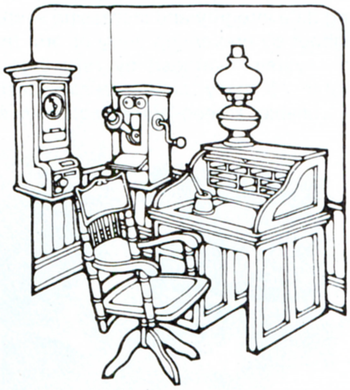
RPM has most of the features of PAS but designed for one unit properties like houses or condominiums. One or several common checking accounts can be used. Price $650.00, demonstration diskette and manual $35.00
MINI-WAREHOUSES MANAGEMENT SYSTEM (MMS)
MMS has many of the PMS features but designed for one common general ledger. Each renter has his own file including home address for mailings. Price $650
PROPERTY ANALYSIS SYSTEM (PAS)
PAS is a system for modeling and projecting cash flow, appreciation, tax considerations, future equity, etc. for all types of income properties. This program was designed for the sophisticated investor. Price $250.00
All programs written in CBASIC under CP/M and compatible with TRS-80II. For additional information please contact:
A-T Enterprises • 221 N. Lois • La Habra, CA 90631 • 213/947-2762

CIRCLE INQUIRY NO. 2



Articles Wanted...

INTERFACE AGE is seeking articles on computer languages for the June issue. Language applications and developmental software will be the key issues covered. Articles intended for the June issue should be received no later than February 16 for consideration.

Other subjects being sought for 1981 coverage include: business hardware, software, and unique applications, computer languages, communications and databases, medical, educational, home applications, peripherals and interfacing products, mini systems in the business field, word processors, and the equipment rental/leasing industry.

The payment rate for articles ranges from $20 to $50 per published page. Pieces describing company projects or products will carry the company byline, but no payment is offered. Submittals should include an abstract, outline and stamped return envelope.

Manuscripts should be typed, double spaced with one-inch margins. Minimum length is four pages, unless programs are included. Photos should be numbered and have a brief description attached. Tables, listings, etc. should be on separate pages and each should have a caption. Computer listings should be printed using a new ribbon to assure good reproduction. Authors are requested to submit a statement of their background and expertise.

The publisher assumes no responsibility for artwork, photos or manuscripts. No acknowledgement is made unless accompanied with a stamped return envelope.

Address all inquiries to Editorial Department, INTERFACE AGE Magazine, 16704 Marquardt Ave., Cerritos, CA 90701. Please do not phone for information about submissions.

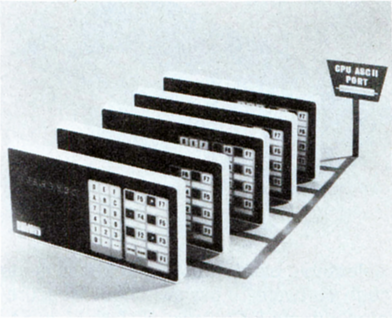
and end of memory—may be selected, stored and transmitted to the computer or printer at the desired points. Transmission stop codes may also be selected, which causes transmission to be suspended when the code is encountered; transmission is resumed upon receipt of a DC1 code. Other useful features include a function memory of 1920 characters reserved for up to 32 programmable functions (24 on dedicated keys), programmable I/O and peripheral data rates, programmable tabs and cursor symbol selection. Wide character display and space-over-data modes are keyboard switch-selectable. The unit is completely modular and can be self-serviced. Price: $1,890. Teleray, Box 24064, Minneapolis, MN 55424, (612) 941-3300.

CIRCLE INQUIRY NO. 195

Dumb video display model ADM-3A + has a keyboard layout similar to the model ADM-3A but includes some additional features. Key features are a built-in numeric keypad with 0-9 numerals, period, comma, tab, minus, and return; separate cursor control keys for single stroke up, down, left, right, and home movement of the cursor; a caps lock key; and full upper and lower case character display with two dot descenders standard. The displayed characters are 5 by 9 dot matrix in a 7 by 10 dot matrix field which allows for a sharp, easy-to-read display screen. Other capabilities include an unshifted RUB key, a tab key to generate horizontal tab codes, auto repeat keys and a stepped control key to minimize operator key stroke errors. A program mode key, designed as a programming aid, permits writing into the display memory and displaying of all control codes in addition to the 96 Ascii character set. Operators can select the word format that is most suitable to their particular systems, whether it be standard 9, 10, or 11 bit words, odd, even or no parity, or one or two stop bits. The unit is software and hardware compatible with all popular Ascii computers. Price: $945. Lear Siegler, Inc. Data Products Div., 714 N. Brookhurst St., Anaheim, CA 92803, (800) 854-3805.

CIRCLE INQUIRY NO. 196

Multidrop capability, TM25 Microterminal, allows a number of terminals to be connected to one serial computer interface. Substantial savings in computer interface and wiring costs result. This microprocessor based data entry-data display terminal provides simplified man/machine interface at a fraction of the cost of printing terminals or full scale CRT's. Operator skill requirements are also reduced. The multidrop communicates in serial Ascii—at 300 baud—with 20mA current loop and RS232C/V.24 conditioning. A waterproof front panel protects an 8-digit LED display and 7 function indicators as well as hexadecimal or numeric keyboard and 7 function keys. The seven segment LED display provides numeric (0-9) as well as hexadecimal (0-9 and A-F) characters. All keys have tactile feedback feature. TM25's buffered data entry permits message verification before transmission to the CPU and allows the terminal to transmit complete messages to the CPU at maximum speed. Measuring 8.5-inches by 4.5-inches by 0.6-inch, the unit mounts quickly on any flat surface. A single DB-25 connector provides power and signal input/out. Unit prices range from $325 in single to $237 in 100 quantities. C.R. Teeple, Burr-Brown, Box 11400, Tucson, AZ 85734, (602) 746-1111.



CIRCLE INQUIRY NO. 197

Full-screen editing is available in the Cosmac CRT data terminal, CDP18S040, containing a 24 line by 80 character per line display plus integral full 73-character Ascii keyboard and 14 dedicated full-screen edit, function keys. Containing an EIA RS232C interface with seven selectable baud rates from 300 to 19.2K baud, the terminal is ideally suited for use with Cosmac microprocessor systems or as a general purpose intelligent terminal. The all-CMOS electronics feature of the terminal provides excellent R.F. noise immunity, extending its applicability from the office into rugged industrial environments. The keyboard features 14 special function keys to provide the fast, efficient full screen editing, providing instant screen verification of text editing changes during microprocessor program development. These powerful features include cursor positioning, 2-speed auto-repeat cursor movement, overtype, character or line insertion/deletion, scrolling (next/previous page), and windowing (next/previous page). Price: $1,195. RCA Solid State Div., Box 3200, Somerville, NJ 08876, (201) 685-6533.

CIRCLE INQUIRY NO. 198

Word processing CRT WP2000 includes LSI microprocessor control with expandable control program, along with Eprom character generator and special function keys. It is adaptable for foreign languages and other special applications. True IBM Selectric keyboard layout, sculptured, hall effect, noncontact keyboard, 15 key cursor positioning and editing keypad all on a removable keyboard, and a 10 key numerical keypad and 8 special function keys are included. A high resolution video monitor provides a clear display utilizing a 9 by 13 dot matrix. Screen size is 12 inches displaying 25 lines including a status line with user message capability. Industrial Micro Systems, 628 Eckhoff St., Orange, CA 92668, (714) 978-6966.

CIRCLE INQUIRY NO. 199

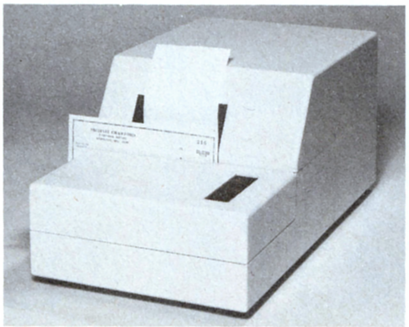
Integral modem model 9103 is designed for use in Televideo 912C and 920C data terminals. An originate-only, scratch pad dialer modem with automatic re-dial capability, the unit operates at a maximum data rate of 450 bits per second asynchronously (300 baud) in full-duplex mode. It is FCC-approved and Bell 103/113-compatible, and plugs directly into the telephone line using a conventional modular jack (located at the rear of the terminal). It uses a standard telephone cable with a six pin modular plug (FCC RJ11C type) to connect to the telephone line. The plug must be compatible with the telephone company's USOC RJ11C standard modular phone jack. The terminal is also compatible with a 1000A data access arrangement unit (CDT), manual DAA. The model only requires the available telephone line and not the telephone itself. Televideo, Inc., 2149 Paragon Dr., San Jose, CA 95131, (408) 946-8500.

CIRCLE INQUIRY NO. 200

Letter-quality printer, the Typrinter 221, is a letter-quality daisywheel printer with five built-in microprocessors providing complete text formatting including right justification and proportional spacing. Also functions as a sophisticated electronic typewriter, bringing new economies to the office or personal computer user. Compatible with all micro, mini and mainframe computers, utilizes a parallel Centronics interface, with RS232C and IEEE-488 interfaces, can respond to formatting commands imbedded in the text, eliminating the need for additional text formatting software. One novel feature is its ability to print in reverse, that is white characters on a black background for highlighting critical information. The printer can also function as an advanced electronic typewriter with alphanumeric display showing the current line, column position, and lines remaining to the end of the page, as well as other useful information. Price is $2,750. Howard Industries, Inc., 2031 E. Cerritos Ave., Bldg. 7K, Anaheim, CA 92806, (714) 778-3443.

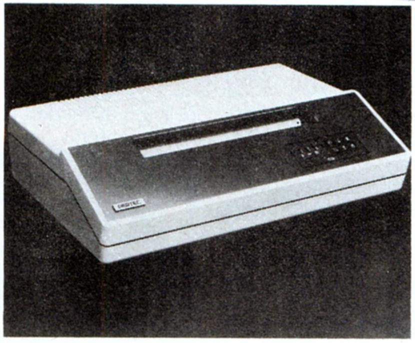
CIRCLE INQUIRY NO. 201

Financial transaction printer model 400T, is a 40 column bi-directional print station that prints in a 40 column format at a continuous rate of 3 lines/second. When used with industry standard two ply 3½-in. wide roll stock, the print station provides a receipt and a stored journal. A single line validation slot is available for check validations (for tracking and validating). Housed in an all metal case, the printer is designed to serve many years in the most demanding applications. Price: in single quantity $735-$750. Capitol Circuits Corp., Printer Products Div., 24 Denby Rd., Allston, MA 02134, (617) 787-2030.



CIRCLE INQUIRY NO. 202

Two matrix printers, the P80 and P250 are for small systems applications. The P80 is low-cost and runs 80-characters-per-second. Features normally found on larger printers have been incorporated into the unit, such as: true character descenders; underlining; bi-directional logic seeking; processing of single-sheet, or continuous and roll forms; and self-testing routines. The P80 utilizes a 7 by 9 matrix with an option that allows a 9 by 9 print pattern. Its charact set features 96 characters in accordan with most international standards (DIN and Ascii); APL and Arabic are optional. The



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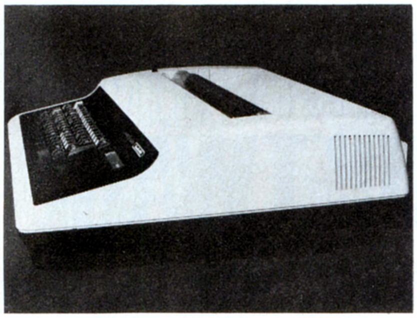
CIRCLE INQUIRY NO. 19

P250 runs 250-characters-per-second. The matrix print head has similar features as the P80's. The unit features bi-directional logic seeking and is capable of operating asynchronously at transfer speeds from 50 to 19,200 baud (serial I/F). A 512 character buffer, which can optionally be expanded to 2048 characters, facilitates uniform transmission. Pertec, 12910 Culver Blvd., Los Angeles, CA 90066, (213) 822-9222.

CIRCLE INQUIRY NO. 203

Tabletop matrix printers incorporate a printhead that allows low sound levels. Two printers offered in the multi-microprocessor-based product line are the Terminet 2030, which prints 30 characters per second, and the Terminet 2120, which prints 120 characters per second. The 7w by 9h dot matrix printhead mechanism employs blade-mounted pins to insure quiet and reliable printing. The DC servo-motor-controlled printhead mechanism allows bidirectional printing without fill characters. A 60-cps catch-up rate is featured on the 2030 and a 150-cps rate is provided by the 2120. Print density is selectable at 10, 13.2 and 16.5 characters per inch along a 13.2-inch print line. Both models offer underline capability. The ribbon cartridge is stationary, with the ribbon driven by a stepper motor. The keyboard is microprocessor-scanned and employs capacitive key switches. General Electric, Data Communication Products Business Dept., Waynesboro, VA 22980, (703) 949-1000.



CIRCLE INQUIRY NO. 204

Text editing typewriter, SE-2000D, includes a 40-character "window into memory" display to complement its many automatic features. The unit offers a built-in memory, high speed printing and error correction, fast and easy text editing, plus automatic text repetition. Stored information may be reviewed on the lighted display word by word at normal reading speed, or by fast scanning line by line to locate a word, sentence or paragraph. High speed search capability scans the memory, automatically stopping at the area where changes are required. Then the user may insert, delete and adjust. The electronic keyboard performs a wide range of automatic functions, including: paper injection/ejection; automatic carrier return; centering on a line or between tab positions; underscoring a word or group of words; decimal alignment; full proportional spacing in three sizes and right margin justification. Adler-Royal Business Machines Inc., 1600 Route 22, Union, NJ 07083.

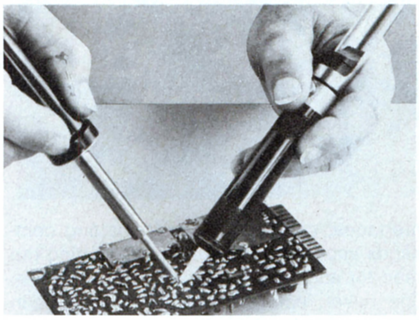
CIRCLE INQUIRY NO. 205

132 column printer, Microline 80, offers a print speed up to 80 cps, 6 or 8 lines per inch, and a 9 by 7 dot matrix. Friction feed and pin feed is standard with optional tractor feed available. Both parallel and serial interfaces allow most microcomputers instant usage. Other features include variable character size, software controls, and up to 10-in. wide paper. Price: $649. Integral Business Systems, 325 E. 48 St., New York, NY 10017, (212) 753-3693.

CIRCLE INQUIRY NO. 206

TOOLS/TEST EQUIPMENT

Desolder pump offers full industrial performance and features. The DSP-1 features all metal construction with precision components for maximum reliability and ease of operation. Compact size facilitates comfortable one hand operation. Suction is precisely regulated for efficient solder removal without damage to delicate circuitry. Self-cleaning on each stroke, the unit is quickly disassembled without special tools for maintenance or repairs. Rugged Teflon tip is easily replaced. Price: $9.95. O.K. Machine and Tool Corp., 3455 Conner St., Bronx, NY 10475.



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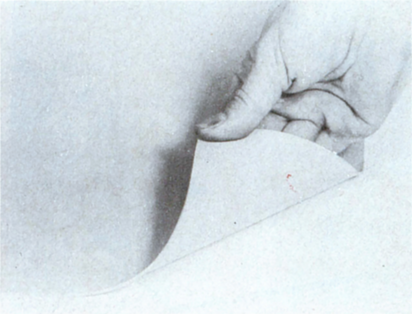

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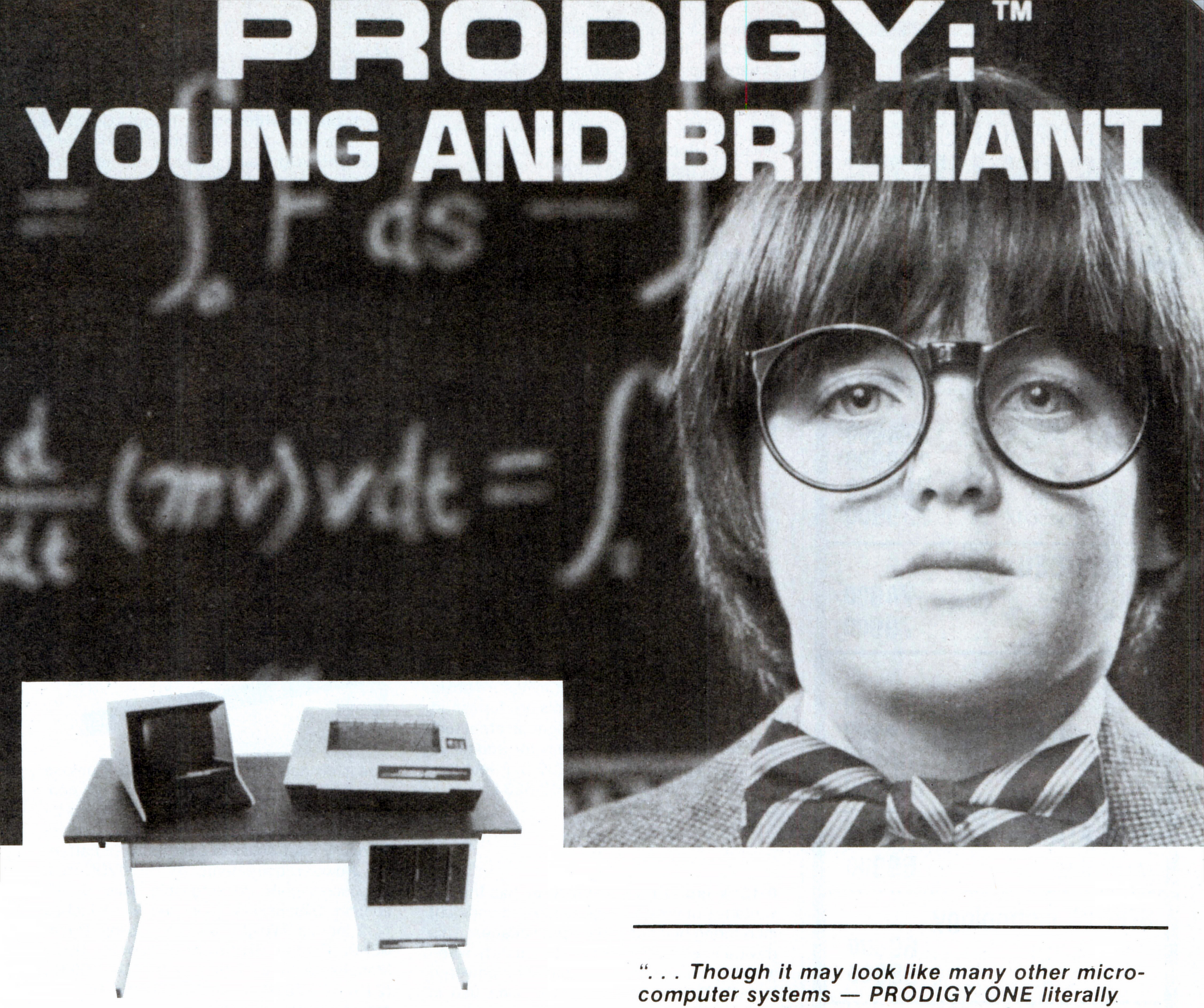

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CIRCLE INQUIRY NO. 87

machines and other equipment, and .060 for inspection, hand assembly or other light duty. Dimensions are 30 × 60, 36 × 60, 30 × 96, and 36 × 96 inches. Custom sizes are also available. Prices are $1.50 per square foot for .060-inch and $2.85 for .125 inch. Wescorp South, 14967 E. Salt Lake Ave., City of Industry, CA 91746.

CIRCLE INQUIRY NO. 208

PC board service kit JTK-47 repairs printed circuit boards, with emphasis on small component removal and replacement. The kit contains a selection of fine tools. Included are 35-watt soldering iron with stand, fork and hook soldering aids, a multi-position work holder and quick-adjust vise for holding circuit boards, DIP extractor, miniature chain nose plier and more. The tools are furnished in a 19 × 7 × 7-inch heavy-gauge steel tool box with tray and extra room for additional tools. Jensen Tools Inc., 1230 S. Priest Dr., Tempe, AZ 85281, (602) 968-6231.

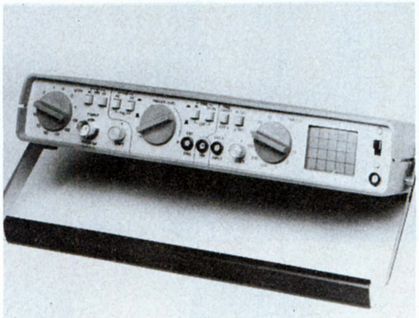
CIRCLE INQUIRY NO. 212

0-150V isolation transformer has the advantages of wide voltage range and constant monitoring of input and output voltages. This device is essential for operator safety when working on electronic equipment powered by AC. Typical applications include use in design, production and quality control as well as field service. The unit is called monitor ISO-V-AC, model WP-29. Output voltage is fully variable from 0 to 150V AC at 2 amp. over the entire voltage range. A 3½-inch taut-band panel meter may be switched to read either the input (direct) or output (isolated) AC voltage. The entire unit is integrated in a low-profile, compact housing with a handle for easy portability. Primary-to-secondary leakage in the WP-29 is less than 0.1mA which meets ANSI spec. 101.1. A special convenience is the provision of output banana jacks so that desired isolated voltages may be applied to equipment through alligator clips. A polarized two-conductor female AC socket is also provided. Price: $140. Robert Liska, Viz Mfg. Co., 335 E. Price St., Philadelphia, PA 19144, (215) 844-2626.

AC VOLTS
VIZ
WP-29
MONITOR ISO-V-AC

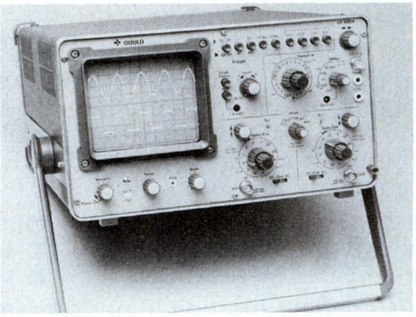
CIRCLE INQUIRY NO. 213

Portable oscilloscope model SC 110 achieves full size oscilloscope performance in a light weight slim package with ultra low power consumption. It is based around a 2 inch diagonal CRT which consumes extremely low power in the heater and deflection circuits. Vertical deflection bandwidth is DC to 10 MHz ± 3db with a sensitivity of 10 mV to 50 V/division in 12 ranges and an input impedance of 1 megohm in parallel with 47 pF. Horizontal bandwidth is DC to 2MHz ± 3db with a sensitivity of 0.5 V/div. and an input impedance of 1 megohm in parallel with 10 pF. The switch selectable timebase spans the range from 0.1 microseconds/division to 0.5 secs./division in 21 increments with a calibration accuracy of ± 3% for all but the fastest rate. The screen graticule is divided into 5 × 4 divisions. A unique economy mode blanks the screen to conserve power until the sweep is initiated by the trigger circuit. Unutilized circuitry is automatically shut down to contribute to battery life. Power requirements: 4V to 10VDC from disposable cells, rechargeable cells, or AC adapter. Dimensions: 10 inches × 5.8 inches × 2 inches. Weight: less than 2 lbs. Price: $369. Energy Electronic Products, 6060 Manchester Ave., Los Angeles, CA 90045, (213) 670-7880, TWX: (910) 328-6161.



CIRCLE INQUIRY NO. 214

30 MHz dual-trace scope, OS1100A, introduces a variable delay between the selected trigger point and the start of a timebase sweep, permitting detailed analysis of a portion of a repetitive waveform. Delay time is variable from 10 microseconds to 100 milliseconds in four ranges with a variable vernier providing continuous selection of delay time between these range limits. An LED indicates when trigger delay is switched in, and the position of the delay is indicated by a blanked-out section of the trace when the delay vernier control is pulled out. The 8 × 10 cm CRT has a 10 kV accelerating potential for clear displays. Sensitivities are switch-



selectable from 2 mV/cm to 10 V/cm, and a variable-gain control can be used to increase the maximum sensitivity to 1 mV/cm on both channels. Timebase speeds range from 200 ns/cm to 2 s/cm and a X10 magnification permits a top sweep speed of 20 ns/cm. A single-shot sweep mode aids photography by eliminating unwanted double exposures. Price: $1,499 including probes and 2-year warranty. Marketing Services, Gould Inc., Instruments Div., 3631 Perkins Ave., Cleveland, OH 44114, (216) 361-3315.

CIRCLE INQUIRY NO. 215

SOFTWARE

BUSINESS

Wall design program, Retwall-1, a retaining wall design package for the TRS-80 model I is interactive, which means that the designer synthesizes his own knowledge and the computing power of the program to develop the best possible design of either block walls or concrete walls with straight (parallel) or tapered sides. The designer is not locked into a few predetermined solutions. The program computes masonry stresses for concrete block walls and displays the maximum height for a given loading condition when masonry stress limits are exceeded. If the design exceeds maximum stress limits, the program lets the designer exercise the poured concrete option or go to full stresses instead of half stresses and call for special inspection. Trial design results are immediately displayed on the video screen and may be printed out if the designer wishes to retain them. The program prints out base sizes together with toe and heel and pressures, as base designs are produced. The program also prints out the required A_s (area of steel) for the toe and heel. Morton Technologies, Inc., Box 11129, Santa Rosa, CA 95406, (707) 523-1600.

CIRCLE INQUIRY NO. 226

Three accounting packages that stand alone or are totally interactive with other accounting packages are written in CBasic-2 to run on most CP/M systems, and come with source code. Order entry/invoicing enters the order, processes it, places items on reserve from inventory, invoices the customer, updates general ledger and posts to accounts receivable. Inventory II, for wholesalers, distributors, and manufacturers, compiles reorder, on order, and stock out reports. Calculates quantity pricing and profit analysis by item. Payroll II interacts with general ledger and posts to job costing. handles up to five deductions including state and federal governments. Software Systems, Inc., 211 N. Broadway, Wichita, KS 67202, (316) 265-8633.

CIRCLE INQUIRY NO. 227

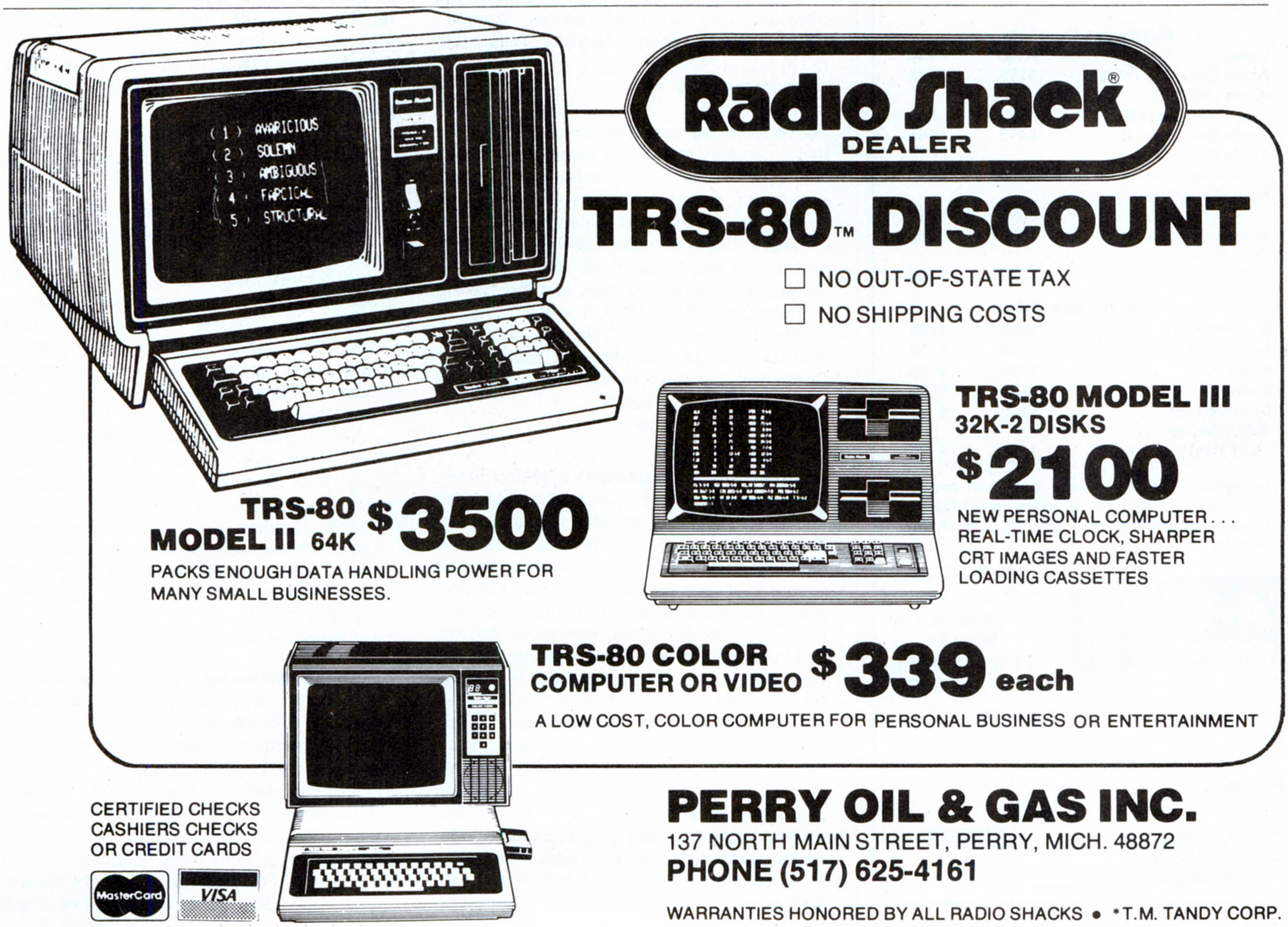
Civil engineering software master package includes 'cogo' calculations, cut and fill calculations, a specification writer and drainage calculations. The programs are designed for use by a current clerical staff by using a menu prompting process. The system is professionally documented with a reference manual that assists in a quick start up and short training for you and your staff. Other features are on-line calculations and retention of information. The calculation includes bearing and distance, new points, tangents, angles, curves, and area. Available on North Star. Micro Software Products, 6902 E. Culver, Scottsdale, AZ 85257.

CIRCLE INQUIRY NO. 228

Cromemco business system software, for use on Cromemco computer systems. The CBS comes in five packages including general ledger, accounts payable, accounts receivable, inventory, and payroll. Software is designed for contractors, wholesalers and distributors, manufacturers, retailers, professional services—for the business person and accountant—who desire fast, accurate, uniform maintenance of their business and accounting records. The packages comprise an integrated system that is powerful, cost effective, and preserves the audit trail so essential to accountants. Detailed documentation accompanies each package including an excellent user manual and introduction manual which provides instruction on the operation of both the hardware and software. Each package available on 5-in. double-sided diskettes or on 8-in. single-sided diskettes for $995. Cromemco, Inc., 280 Bernardo Ave., Mountain View, CA 94043, (415) 964-7400.

CIRCLE INQUIRY NO. 229

Payroll system, version V, for the Apple comes in two configurations: single-disk drive and dual-disk drive, and effectively performs full payroll functions for up to 45 and 150



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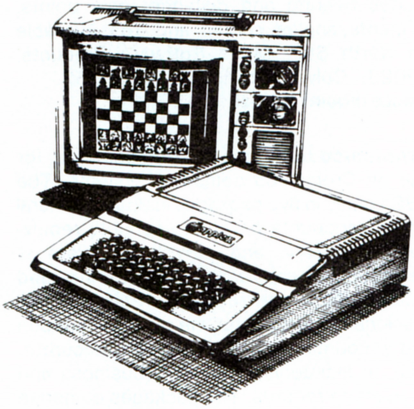

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employees. System features user-changeable tax rates, complete source listings in Basic, fully documented file layouts for customization and a menu-driven control system. Handles payrolls where employees have different frequencies of pay, multiple-states and complex city taxes. These features, as well as the manner in which the user can handle full personnel records, time card entries with overtime, 941A federal listings, W-2 forms, paychecks and paylistings, and summary reports, were incorporated into the payroll system with the assistance of small business owners. Price is $299. Lenz, Masterson & Assoc., Inc., 684 Haddon Ave., Collingswood, NJ 08108.
CIRCLE INQUIRY NO. 230

Property management package is designed for rental property money management for up to 250 units per account, unlimited number of accounts. It records and calculates accounts payable, accounts receivable, and general ledger; it keeps track of tenants by due date and by apartment; has automatic aging of current and future tenants for both apartments and parking. Keeps track of income and expenses by building and account number. Price $695. Blue Lakes Computing, 3240 University Ave., Madison, WI 53705.
CIRCLE INQUIRY NO. 231

Software for 8200 system includes word processing, order entry, inventory control, accounts payable, accounts receivable, general ledger, payroll, sales analysis, communciations, professional timekeeping and billing, mailing, real estate analysis, data base management, and mailing. CP/M is available to accommodate software packages developed by other companies. Compal, 8500 Wilshire Blvd., Beverly Hills, CA, (213) 652-2263.
CIRCLE INQUIRY NO. 232

Software program called Commercial Mailer has a capacity of 30,000 names per mailing list, is menu driven, and has features such as create list, select, display, report, maintain by zip or alphabetical order, finds entry, browses, changes, adds, deletes, searches, and has utility/code field. Lists can be located anywhere on a disk, and the system can produce 1UP, 2UP, 3UP or 4UP Cheshire or pressure sensitive labels. Program available for $250 plus $3 shipping. Stonehenge Computer Company, 89 Summit Ave., Summit, NJ, (201) 277-1020.
CIRCLE INQUIRY NO. 233

Information management system, Prism, that integrates the features of a data base management system with those of a program development system, enabling users to develop applications like mail lists, patient records, or real estate listings without programming, along with more complex applications such as accounts receivable, payroll, and inventory control. Features and capabilities include user-oriented displays and operator prompting, user-definable, multi-keyed data structures, user-definable reports, and browse functions. Also available is a sophisticated data management language for Prism data files, user-definable menus, password protection of sensitive functions and files, display formatting and data entry functions, and a complete library of programming aids. Runs on micros using CP/M and CBasic with 48K or more, one diskette, a CRT with cursor addressing and clear screen features. Micro Applications Group, 7300 Caldus Ave., Van Nuys, CA 91406, (213) 881-8076.
CIRCLE INQUIRY NO. 234

Business management applications software includes: general ledger, accounts payable, accounts receivable, payroll, order entry/inventory, apartment management, construction management, mortgage management, escrow management, and manufacturing management. Software runs on the IBC System 40 with up to five users, 128K of memory, and up to 22M bytes of disk storage. Integrated Business Computers, 22010 S. Wilmington Ave., Carson, CA 90745, (213) 518-4245.
CIRCLE INQUIRY NO. 235

Customized accounting systems, CBS version 1.1, receivables, inventory control and order entry, can be used to define an application such as an inventory control system by specifying master files to describe the inventory, customer and vendor files. Transaction files are used to describe specific activities, i.e., purchases, sales. A simple entry procedure is used to enter customer, vendor, inventory, sales and purchasing information. After data entry is completed, an update program processes the transactions against the master files, updating account balances and inventory data. Features a comprehensive report generator for producing invoices, purchase orders, reorder reports, special reports, mailing labels, menu chaining to create a "menu of menus" that permits one main entry point to be used for access to all application routines, and batched updating to update a master data base and create new records in master files. Price is $395 with $25 for updates. Documentation alone is $40. Lifeboat Assoc., 1651 Third Ave., New York, NY 10028, (212) 860-0300.
CIRCLE INQUIRY NO. 236

Solar energy system simulation teaches about and aids in the design of solar energy systems. To choose a solar energy system, one must consider heating capacity, heat delivery, environmental factors, and economic factors. Software system consists of three programs: Thermal Analysis, Economic Analysis and Builder Program to create climatic data tapes. Thermal Analysis allows multiple design options to be examined quickly and easily. Economic Analysis determines the cost effectiveness of the solar system on a life cycle basis. Builder Program lets the user create a data tape for a specific geographic location. Available on cassette ($49.95, requires 16K) or floppy disk ($99.95, requires 32K). The disk version includes climatic data for 70 cities, automatic chaining, and a line printer option. Peripherals Plus, 119 Maple Ave., Morristown, NJ 07960, (201) 267-4558.
CIRCLE INQUIRY NO. 237

Business planning system, the Target, consists of six planning modules that generate proformas, income statements, balance sheets and cash flow schedules, as well as business and statistical analyses. Financial models are created with English-like commands of the user's design, allowing those with a limited background in programming the opportunity to do financial planning on a micro. Advanced Management Strategies, P.O. Box 95130, Executive Park

Branch, Atlanta, GA 30347, (404) 294-9444.
CIRCLE INQUIRY NO. 238

Aircraft maintenance system written for an Ohio Scientific C3 computer and developed for Teterboro Aircraft Service at Teterboro Airport, NJ, features three key functions: order entry, covering orders placed with vendors for either inventory or customer jobs; inventory control, and sales history of inventory. Program is priced at $2,495. Custom Tailored Software, Inc., 93 Old Homestead Rd., Wayne, NJ 07470.
CIRCLE INQUIRY NO. 239

Multi-client general ledger system for use in a multi-client environment is a transaction report, a general ledger report by accounts, account balance sheets, a profit and loss sheet, a chart of accounts (for review of accounts), and a year end trial balance sheet. The system also includes client profile sheets and processing transmittals. All reports except the trial balance are on 8½ by 11 paper, making the reports easy to file. No computer knowledge is required, only basic accounting skills. System source code and user manual are $195 on 8-in. floppy disk. All programs are in CBasic and run under CDOS or CP/M. Datatrac, Inc., 3521 18th St., Suite 202, Metairie, LA 70002, (504) 456-2908.
CIRCLE INQUIRY NO. 240

General ledger system provides a sophisticated bookkeeping method with optional year-to-year comparisons, automatic posting of retained earnings and up to nine divisions and summaries for departmentalization or multi-company listings. Transactions may be entered through direct posting, cash journal, accounts payable or accounts receivable. Reports consist of trial balance, income statement, balance sheet and special accounts. Account data maintained by month for the previous years. Runs on TRS-80 model II with 1-4 disk drives in Microsoft Basic. Price: $249.95. Taranto & Assoc., P.O. Box 6073, 121 Paul Dr., San Rafael, CA 94903.
CIRCLE INQUIRY NO. 241

Full-scale financial modeling package, the Micro-Modeler, written in Pascal, runs on the Apple computer and features easy-to-use English-like commands; built-in financial functions like depreciation, internal rate of return, tax loss carryforward; ability to solve simultaneous equations; consolidation; flexible, time saving report generator; powerful built-in text editor; and an exceptional graphics package with color piecharts, barcharts, and line graphs. The software is $1,500, user manual $35. Ferox Microsystems, 5881 Leesburg Pike, Falls Church, VA 22041, (800) 336-4766.
CIRCLE INQUIRY NO. 242

Financial accounting set for Z80-based micros is written in Cobol and runs under the Oasis operating system, includes sales order processing, accounts receivable with billing and sales analysis, accounts payable, general ledger, inventory, payroll and job cost. All programs will run on single or multiple-user hardware systems supporting both disk and diskette storage. Features include open item and balance forward accounting; 'lifo', 'fifo' and average cost methods of inventory valuation; single or multiple company processing; revenue and expense accounting by job or phase; and a report generator for financial statements. Interface switches can be set by the user to control the complexity of accounting interactions. Open Systems, Inc., Suite 409, 430 Oak Grove, Minneapolis, MN 55403, (612) 870-3515.
CIRCLE INQUIRY NO. 243

Data-base management system, the Condor 20/DBMS, designed for Z-80 micros can be developed by noncomputer people using an English-like command language. Applications are for personnel records, accounting functions, inventory control, or other business reporting requirements. The version uses 19 commands including operations for selecting, sorting, appending, or posting data, and runs with at least 48K RAM under CP/M. Price is $695. Condor Computer Corp., 3989 Research Park Dr., Ann Arbor, MI 48104, (313) 769-3988.
CIRCLE INQUIRY NO. 244

Accounting software, Temp, for temporary help employment agencies, which have massive cash flow and paperwork problems, has been developed for the IBM 5110 and 5120 systems. These firms pay commissions to salespeople who place temporary help, pay clerical management salaries and other overhead long before they are reimbursed by customers. Features include skill code analyzer, daily/weekly processing, automatic customer billing calculated from employee payroll information, issuing single or multiple checks per employee, and producing timely accurate reports. Software Data Systems, 320 Main St., W. Orange, NJ 07052, (201) 677-0801.
CIRCLE INQUIRY NO. 245

Advanced payroll system, PR, for the TRS-80 model II requires TRSDOS 1.2, a 132-column printer, a dual-disk system and 64K memory. It calculates payroll for every type employee while maintaining monthly, quarterly and yearly totals for reporting purposes in multiple states. Tax tables are maintained by the users via on-line commands with no programming required, also integrates with firm's general ledger system. Outputs paychecks, 941s, W-2 forms, paycheck register, monthly summary, G/L transactions register, and employee file list. Price of $129 includes 100-page manual, installation guide, and 8-in. diskette. Micro Architect Inc., 96 Dothan St., Arlington, MA 02174.
CIRCLE INQUIRY NO. 246

Public opinion (or political) poll and market research programs, compatible with TRS-80 models I, II, or III, permit the user to perform political polls, public opinion, sociological, or market research. They permit virtually total flexibility in the design of questionnaires, even allowing for "open ended" questions. The user has the ability to define the substantive questions and alternatives as well as the demographic categories and subcategories. Safety features protect against faulty data entry. This package was actually designed and used in a political poll commissioned by a candidate for U.S. Senator. The 14-page manual is easy to understand. Price is $99.95. M, M, & S Software, 3 Seabrook Court, Stony Brook, NY 11790.
CIRCLE INQUIRY NO. 247

Visicalc programs turn a personal computer display into an interactive electronic worksheet. The software creates a 64-column

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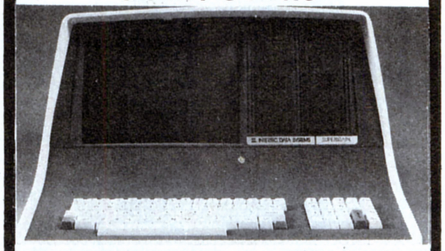

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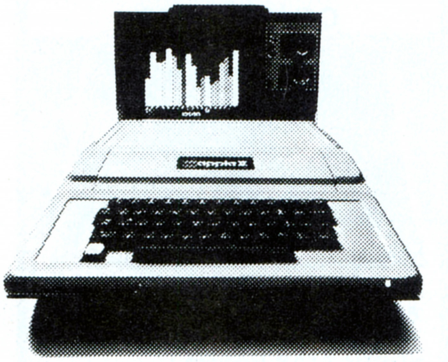

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CIRCLE INQUIRY NO. 248

Master tax program processes an average return in less than 30 minutes on an 8080 compatible micro. Software is for attorneys, and tax services which prepare more than 100 tax returns annually. Prepares schedules A, B, C, D, E, F, G, R/RP, SE, TC, ES, and forms 2106, 2119, 2210, 3468, 3903, 2441, 4625, 4726, 4797, 4972, 5695 and 6251. A major feature is that all data entry sequences are entirely form-oriented. Printing can be done on preprinted continuous forms, overlays, or on computer generated, IRS approved forms. Cost is $995 and $30 for documentation alone. Lifeboat Assoc., 1651 Third Ave., New York, NY 10028, (212) 860-0300.

CIRCLE INQUIRY NO. 249

EDUCATIONAL/GAMES

Educational administrative package to computerize classroom scheduling on the Apple computer, the Class Scheduling System, prepares all input forms, reports expected, and final master school rosters and individual student schedules. The system allows the school to define required courses, if any, and prepare individual student input forms for upcoming semesters, quarters or trimesters. Students, with counsellor or homeroom assistance can prepare the student request forms including optional and alternative course desires. The counsellors can assign priorities for required courses, prerequisites or for units required for graduation this period. The system will handle up to 2,400 students at a time. Up to 1,000 courses are possible with up to 16 choices and alternates per student. The system requires 48K and 2 disk drives along with an 80-column printer. Price: $249.95. The documentation manual available separately for $25. Charles Mann & Assoc., Micro Software Div., 7594 San Remo Trail, Yucca Valley, CA 92284, (714) 365-9718.

CIRCLE INQUIRY NO. 254

Assistant principal for the Apple computer, is a complete administrative package for high school and junior high schools. The package provides control of class rosters, student master records, student schedules, teacher assignments, and grade reporting. The system allows the school administrator to design student input documents, enter students onto the system, schedule classes, print class rosters, accept grades and test scores, print report cards, print file folder labels and prepare student master records. The system automatically prints ranked class lists and records attendance information. Requires 2 disk drives and Applesoft in ROM. Seven diskettes with a 2-volume operating manual is $500. Operating manuals available separately at $50. Monument Computer Service, Village Data Center, Box 603, Joshua Tree, CA 92284, (800) 854-0561, ext 802.

CIRCLE INQUIRY NO. 255

Introductory calculus courses, 12 programs designed for high school and college levels, for a Commodore PET/CBM micro having at least 8K of storage is recorded on a C-10 cassette and accompanied by simple descriptive instructions. Each program generates a set of problems. Answers may be generated so that the student may check his own work or these answers may be suppressed. The student solves his set of problems away from the computer. When his work is completed, the student enters his code number and answers and the computer will then grade his work, displaying the answers to those questions that were incorrectly solved; a percent score and a brief comment reflecting an overall evaluation are also given. Price: $20 each; diskette with all 12 programs $180. Microphys Programs, 2048 Ford St., Brooklyn, NY 11229, (212) 646-0140.

CIRCLE INQUIRY NO. 256

Video game cartridges Skiing and Bridge are used in the Atari video computer system. Skiing features a wide variety of slalom and downhill ski runs, at varying levels, to test everyone from beginners to experienced skiers. The player controls an on-screen skier by using a joystick controller. Players race against the clock or glide leisurely downhill, dodging trees and jumping moguls along the way. With Bridge, the player controls the strength of hands to be dealt and the play of the game. Hundreds of millions of hands can be dealt at random by the game computer. The computer bids as a partner (using the standard American point count system with Blackwood and Stayman conventions) and plays as opponents once a contract is established. Prices: Skiing $21.95, Bridge $29.95. Activision, 759 E. Evelyn Ave., Sunnyvale, CA 94086.

CIRCLE INQUIRY NO. 257

Flight game, Dogfight, allows the player to be the pilot of a jet going into combat. You may fly alone on this mission, or you may have another pilot flying with you to defeat the enemy. There are 16 levels of difficulty with more and faster jets to fight against. You can create a custom game with as many as eight players crowding around an Apple keyboard controlling their own planes. It is available on disk for $29.95 using 32K. Micro Lab, 811 Stonegate Dr., Highland Park, IL 60035, (312) 433-7877.

CIRCLE INQUIRY NO. 259

Language system facilitates computer-aided instruction for educators and corporate and industrial trainers. Apple Pilot provides a courseware development environment, and extends color graphics and sound capabilities to design lessons that are more exciting and effective. Text, pictures, sound and even foreign language characters can be developed and integrated into lessons stored on one or more diskettes. It will run on an Apple II or Apple II Plus with a minimum of 48K bytes of

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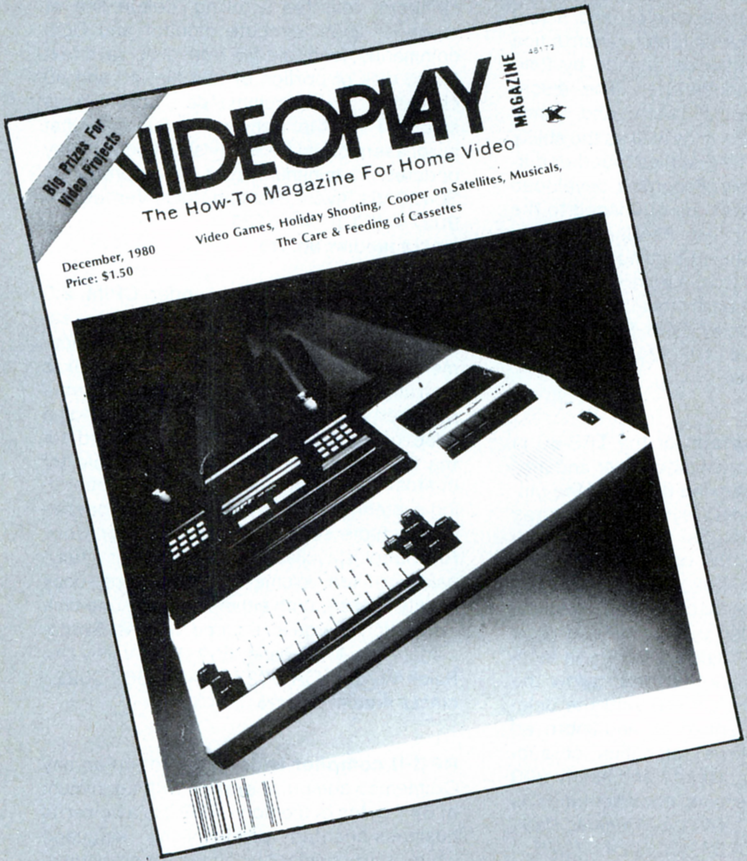

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user memory. Price is $2,785. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014, (408) 996-1010.
CIRCLE INQUIRY NO. 260

SYSTEMS

Development software, a series of cross-assemblers, enables any CP/M system to serve as a development station for the Fairchild F8/3870 single-chip processors. The software system features a macro-assembler, an interactive editor/assembler, and a text editor. The assemblers feature instruction mnemonics and syntax as defined by Fairchild, the chip manufacturer. The macro assembler includes full macro and conditional assembly features as well as the ability to chain a series of source files together during a single assembly. Programs developed under this system must be off-loaded to the target processor for test. Facilities are provided to implement the off-loading mechanism as a direct transfer from memory, via a byte stream over a CPU port or via .com or .hex disk files. Allen Ashley, 395 Sierra Madre Villa, Pasadena, CA 91107, (213) 793-5748.
CIRCLE INQUIRY NO. 265

Disk operating system for the TRS-80 is designed for the sophisticated user and professional programmer who demands the ultimate in disk operating systems. Features are: Basic commands that support files with variable record lengths up to 4,095 bytes long, mix or match disk drives, a security boot-up for Basic or machine code application programs, editing commands that allow program lines to be deleted from one location and moved to another or to allow the duplication of a program line with the deletion of the original, enhanced and improved 'renumber' that allows relocation of subroutines. Price with diskette and nearly 200 pages of comprehensive documentation is $149. Apparat, Inc., 4401 S. Tamarac Parkway, Denver CO 80237, (303) 741-7275.
CIRCLE INQUIRY NO. 266

Improved disk operating system, DOS 3.3, for Apple disk II floppy disk subsystem lets users write source code in 6502 assembly language and facilitates Applesoft and graphic program development. A housekeeping program efficiently stores, catalogs and retrieves diskette programs and data files. It uses a 16-sector storage format that increases the capacity of a diskette by more than 20%, from 116K to 143K. The system can copy a program from one diskette to another using a single disk drive. This gives even the single disk-drive user the ability to create backup copies of programs and files. Price is $75 for one diskette and two manuals. Apple Computer Inc., 10260 Bandley Dr., Cupertino, CA 95014, (408) 996-1010.
CIRCLE INQUIRY NO. 267

Operating system for the Intel 8088/8086 processor, CP86, includes dynamic file management, an 8086 assembler with manufacturer compatible mnemonics, a general purpose text editor, and an advanced program debugger. File structure, command syntax and system calls are almost entirely compatible with CP/M 2.2. Price is $300. Midwest Micro-Tek, Inc., P.O. Box 29411, Brooklyn Center, MN 55429.
CIRCLE INQUIRY NO. 268

6502 development system contains within one program a text editor, assembler, disassembler and symbolic debugger available on Apple compatible diskette with slightly over 8K RAM. The system is available on Eprom with socket adaptors to replace integer Basic and convert the Apple computer to a 6502 development tool. The text editor supports the entry and maintenance of assembler text files. Commands include: auto line numbering, link multiple text files with forward and backward pointers, locate and replace labels, list file or selected line numbers, text file scrolling, delete line or range of lines, execute monitor and DOS commands, load text file from disk, save text file to disk or portion of text file, 40 and 80 character print commands. Eprom was selected for the firmware version so that purchasers could be easily supplied with any updates at minimum cost. Microproducts, 30420 Via Rivera, Rancho Palos Verdes, CA 90274, (213) 541-5131.
CIRCLE INQUIRY NO. 269

RM/Cobol for operation under CP/M 2.0 provides the language level and features required for real-world application development. It is compatible with Cobols for Texas Instruments, NCR and Zilog, and presents the user with an established and expanding base of serious applications. Designed for the OEM market, RM/Cobol is available for custom installation under the OEM's operating system or under general-purpose operating systems such as Oasis, CP/M or Unix. RM/Cobol is available to OEMs under a fully-paid unlimited volume license or a per-copy royalty license. With either license, a one-time installation charge is required. Michael Saccomano, Ryan-McFarland, 609 Deep Valley Dr., Palos Verdes, CA 90274, (408) 662-2522.
CIRCLE INQUIRY NO. 270

RPG-II compiler is designed to run on any Cromemco computer system with a minimum of 64K bytes of memory. RPG II is a powerful business-oriented programming language which is the primary language for small business computer users. Cromemco RPG II is a result-oriented language oriented toward the business user's problems, describing reporting requirements rather than being aimed primarily towards computer procedures. Routine report and file updating jobs can be programmed and debugged very quickly. The compiler supports sequential, indexed-sequential, and direct-access disk files and contains powerful table and array-handling facilities. It reads and compiles statements at a rate of one hundred per minute. It also has the capability of calling assembly language subroutines. The compiler is available on either 5-inch floppy diskette (model RPG-S) for double-sided drives only or 8-inch floppy diskette (model RPG-L) for single or double-sided 8-inch disk drives for $595. Cromemco, Inc., 280 Bernardo Ave., Mountain View, CA 94043, (415) 964-7400.
CIRCLE INQUIRY NO. 271

Pascal reference card is a compressed assemblage of almost everything needed to program in Pascal. On one folded 8½ × 11-inch card, all the following data are easily available: Ascii chart, procedure and function definition, reserved and predefined words, I/O error return, setup parameters, P-code chart, and operators with precedence. Price: $2. Modular Software, Box 12883,

CIRCLE INQUIRY NO. 89

San Antonio, TX 78212, (512) 657-3210.
CIRCLE INQUIRY NO. 272

Industry standard Fortran allows technical professionals and educators to develop and run Fortran programs on Apple computers. Apple Fortran becomes part of a versatile software development environment, including an editor, linker, file handler, assembler, Apple Pascal compiler, and system library. The language system lets the user create and integrate Fortran, Pascal and assembler routines into a single program. The library provides access to special Apple features like sound generation, control paddles and high-resolution graphics routines. The language will run on an Apple II or Apple II Plus with a minimum of 48K of memory and the Apple language system. Also required are a video monitor or standard television, and an Apple II disk drive with controller. Price: $200. Apple Computer, 10260 Bandley Dr., Cupertino, CA 95014, (408) 996-1010.
CIRCLE INQUIRY NO. 273

Standardized calling conventions have been adopted by Microsoft and under are consideration by several other companies. Standards are designed to enable Z8000 programs written in any language to call programs written in any other language. In addition to providing for communication between languages, the standard conventions enable compilers for all Z8000 languages to generate object code with efficient parameter-passing capability. A simple algorithm assigns every member of a parameter list either to a register or to storage. The algorithm handles value, result and reference parameters for both the segmented and non-segmented versions of the Z8000. Zilog, Inc., 10460 Bubb Rd., Cupertino, CA 95014, (408) 446-4666.
CIRCLE INQUIRY NO. 274

Computer programs to support applications development for the Zilog Z8000 16-bit microprocessor, the Microbench Z8000, operate in conjunction with Digital Equipment PDP-11, LSI-11 and VAX computers to provide an economical program development capability for the Zilog 8001 and 8002 microprocessors. Included are relocating assembler, linking loader, librarian and object file formatter. The assembler is source compatible with the Zilog assembly language, supports extensive macro and conditional assembly capabilities, cross reference listings and a system macro library. The loader provides linkage facilities, selective loading from libraries, and directives for specifying ROM/RAM alignment boundaries. Perpetual license fees start at $1,695, including documentation and first year's maintenance. Virtual Systems, Inc., 1500 Newell Ave., #406, Walnut Creek, CA 94596, (415) 935-4944.
CIRCLE INQUIRY NO. 275

NSBasic interface is a simple, understandable conversion kit which enables users of North Star Basic to operate under CP/M. All the features of Basic are fully supported and all North Star Basic programs can be used. The converted NSBasic starts at 100H allowing more room for the user. Full CP/M dynamic handling of files as well as automatic creation and replacement of files, as well as proper handling of DOS filenames under CP/M. An extended assembly call allows safe user routines and passing of an unlimited number parameters. Destroy command allows deletion with full name matching capability. CP/M disk change provided by a new command—'reset'. Special package price is $99, including all features of CP/M 2 and CDOS 2 from the original authors of CDOS. InfoSoft Systems, 25 Sylvan Rd. S., Westport, CT 06880, (203) 226-8937.
CIRCLE INQUIRY NO. 276

UTILITY

Pascal Express, a package of utilities and other software for the Apple II, is designed to help users with some programming experience in Basic to get acquainted with UCSD Pascal. Four procedural units are provided, in a format easily adaptable to any application. They simplify input/output formatting, allow access and/or change in the disk directory from a Pascal program, perform integer-string-real conversion, and support files of variable-length records. Five sample programs are also on the disk. They are a set of simple Pascal demos with listings on Basic equivalents, formatter for simple word processing, and a program to maintain a variable-length data file for the international traveler. Includes manual, disk, and source code files. Price: $45. Software Express, Box 50453, Palo Alto, CA 94303, (415) 856-9244.
CIRCLE INQUIRY NO. 279

Keyword indexing system for the TRS-80 accomplishes the complicated and tedious job of cross referencing or indexing information. The larger multiple-disk user can create a disk data file, build an index of all occurrences of "keywords" in the file, and inquire into that file using any combinations of keywords. The inquiry program enables the user to access the data file through the keyboard by simply entering combinations of words to search on. The package also includes a series of access subroutines that can be included in a user program. Available in two versions: a single disk system (less than 600 records per file) is $39.95, 2-disk system is $49.95. Both versions require 32K of memory and run under TRS/DOS. Northeast Microware, P.O. Box 2133, Boston, MA 02106.
CIRCLE INQUIRY NO. 280

Apple record manager allows complete file to be brought into memory so that record searches and manipulations are instantaneous. Records within any file can contain up to 20 fields with user-defined headings. Information can be string or numeric. Users can browse thru files using page-forward, page-backward or random search commands. Records can be manipulated easily and can be altered at will, and files can be stored on the same drive as the master program (if just one drive is available) or on a second drive, as desired. Files can be dumped to a printer at user-option. Several add-on modules interface: one is Pre-Edit, which allows the user to set up a list of edits against which data are tested at time of entry. A second is Statistics Interface. It gives the user the opportunity to use a wide variety of statistical tests on the fields within the files. A third is Check-Book Summarizer that creates files to serve as checking accounts, and to produce the usual reports for such. Requires Applesoft in ROM, 48K of RAM, and costs $35. Connecticut Information Systems, 218 Huntington Rd., Bridgeport, CT 06608, (203) 579-0472.
CIRCLE INQUIRY NO. 281

Three utility packages containing tools for Alpha Microsystems programmers include a new capability for accepting text into Basic, a simple but versatile universal menu generator and a varied package of new subroutines and programs. Invue is an assembly-language subroutine that replaces the 'input' statement in a Basic program, displays a prompt and checks each entered character against a variety of criteria. Simplify your Basic programs dramatically and give the poor keyboard operator a powerful and familiar data entry environment at the same time. Price: $75. Comenu is a set of programs that allow the creation, running and documentation of customized user menus. Unrestricted interlinking of menus is allowed, and direct access to the 'help' function is provided. Price: $95. Other utilities include: 'Alsel.sbr' processes alphabetic input; 'bitpak.sbr' packs and unpacks strings into bitmaps; 'column.sbr' displays text in columns; 'xline.sbr', 'yline.sbr' and 'xbox.sbr' draws lines and boxes. Complete documentation (50 + pages) $5. FoxWare Systems Corp., 17925-G Sky Park Circle, Irvine, CA 92714, (714) 957-9332.
CIRCLE INQUIRY NO. 282

Software tools for word processing, software development, and timesharing access for Heath/Zenith 8080/Z80 computers. Word processing is provided by the PIE 1.5 full screen text editor and the Text text formatter. These programs supply word processing capability usually found only in costlier systems. With cursor motion keys allowing editing anywhere on the screen, and 24 function key commands, PIE is easy to learn and natural to use. The compiler implements a large subset of the C programming language and includes a runtime I/O library providing many large-system features. All software is economically priced in the $20-$40 range, and runs on the H89, Z89 and H8 (with H19) computers under the HDOS operating system in 32K. The Software Toolworks, 14478 Glorietta Dr., Sherman Oaks, CA 91423, (213) 986-4885.
CIRCLE INQUIRY NO. 283

Transfer utility to transfer CP/M files between computers at full data speed (no conversion to hex), with CRC block control check for very reliable error detection and automatic retry, has full wildcard expansion to send *.COM, 9600 baud with wire, 300 baud with phone connection. Includes 8080 source code. Price is $249. Starr Computer Systems, 6126 Melissa Lane, Omaha, NE 68152, (402) 571-1722.
CIRCLE INQUIRY NO. 284

Super Disk for the Radio Shack TRS-80 model II contains 48 programs designed to help management, accountants, investors and students in solving a variety of problems. It has a menu that allows the user to select any program desired. Programs include installment sales reports, amortization schedules, depreciation calculations, interest and loan computation, rule of 78 computation, stock option purchase analysis, two different sorting programs, a binary search program, integration programs, geometry programs, and coordinate conversion programs. Price is $19.95. National Software Marketing, P.O. Box 6195, Hollywood, FL 33021.
CIRCLE INQUIRY NO. 285

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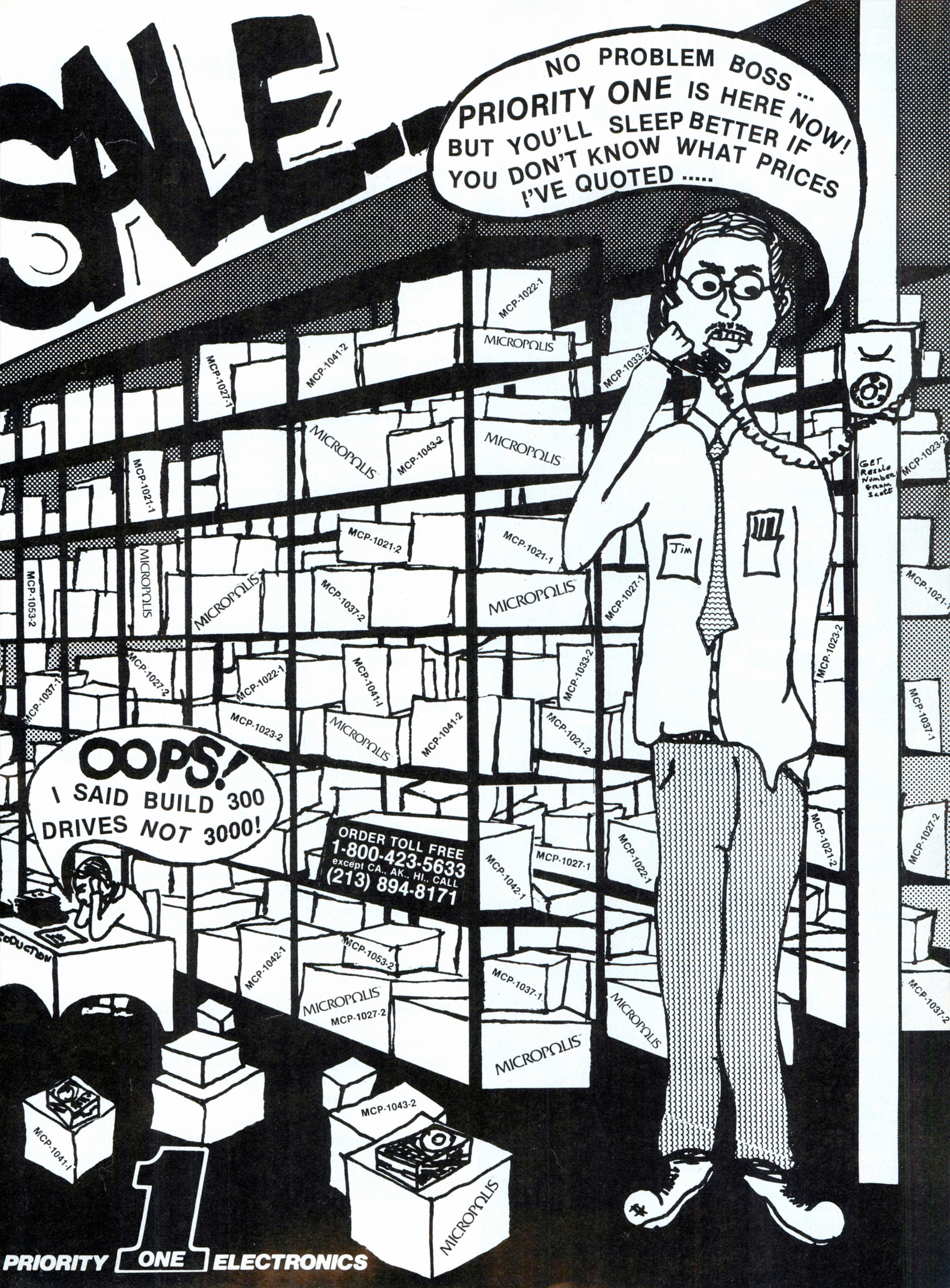
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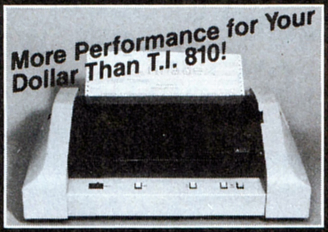

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Engineering manual. A 192-page publication specifies performance, price, dimensions and usage for more than 100 products including modules, interface boards, systems, and software subroutine libraries. A 37-page tutorial section is included. Nick Baran, 4 Strathmore Rd., Natwick, MA 01760, (617) 655-5300, Telex 948474.

CIRCLE INQUIRY NO. 300

Word processing guide. Glossary provides definitions of common terms used in word processing, printing, and phototypesetting. Inprotec, 375 Distel Circle, Suite B-9, Los Altos, CA 94022, (415) 965-4660.

CIRCLE INQUIRY NO. 301

Resistor bulletin. A 4-page pamphlet describes a series of hermetically sealed TO-99 configuration precision resistor networks. Provided is information on design considerations such as chip size, dimensions, and resistance ranges. Bulletin NW600. Vishay Resistive Systems Group, 63 Lincoln Highway, Malvern, PA 19355.

CIRCLE INQUIRY NO. 302

Accessories catalog. The twentieth edition of the annual Inmac catalog features more than 1000 products including magnetic media, cables, furniture, storage devices, and safety equipment. Inmac, Dept. 1021, 2465 Augustine Dr., Santa Clara, CA 95051.

CIRCLE INQUIRY NO. 303

Microprocessor systems analyzers. Brochure describes AE-4100 series of analyzers for 8-bit microprocessor units. Three models are included, designed for use with Intel 8080A, Zilog Z-80 and Intel 8085A processors or their equivalents, plus three additional units that include a cassette MT. Inaba Corp., 11060-B Artesia Blvd., Cerritos, CA 90701.

CIRCLE INQUIRY NO. 304

Tape and disk units. An 8-page catalog illustrates line of tape transports, disk drives, cartridge transports, asynchronous incremental recorders, and control units. Kennedy Co., 1600 S. Shamrock Ave., Monrovia, CA 91016, (213) 357-8831.

CIRCLE INQUIRY NO. 305

Software guide. A 12-page catalog describes eight micro software packages, including assistance with customer problems. A table compares the Wp Daisy word processing package with other systems. Infosoft Systems, Inc., 25 Sylvan Rd. S., Westport, CT 06880.

CIRCLE INQUIRY NO. 306

Forms detacher. A 4-page brochure describes the 385 continuous forms detacher. Standard features, options, set-up, and operation are included. Moore Business Forms, 1205 N. Milwaukee Ave., Glenview, IL 60025, (312) 291-8227.

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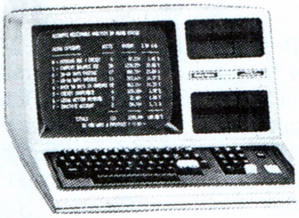

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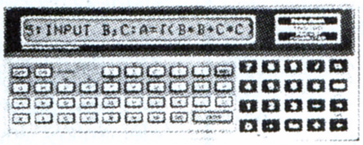

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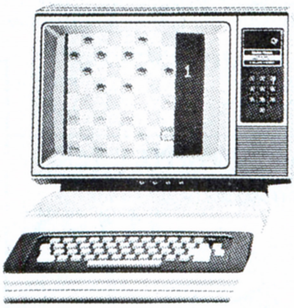

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CALENDAR

Jan 8-11 Winter Consumer Electronics Show, Convention Ctr., Las Vegas, NV, over 750 exhibitions demonstrating creative ways to advertise and promote consumer electronics products, including seminars on personal electronics, personal communications, audio/video hardware and software. William T. Glasgow, Consumer Electronics Shows, Two Illinois Center, Suite 1607, 233 N. Michigan Ave., Chicago, IL 60601, (312) 861-1040.

Jan 12-13 MRP Seminar, Peachtree Plaza, Atlanta, GA, a seminar including tips on how to make computerized manufacturing planning and control work conducted by Robert French, an experienced metalworking engineer. Also held Feb 2-3 at Hotel Meridian, Houston, TX. Pam Richards, McGraw-Hill Seminar Center, 305 Madison Ave., Room 3112, New York, NY 10017, (212) 687-0243.

Jan 13 Invitational Computer Conference, S. Coast Plaza Hotel, Costa Mesa, CA, one in a series of ten national conferences, including displays of operating equipment by several leading manufacturers. B.J. Johnson and Associates, 2503 Eastbluff Dr., Suite 203, Newport Beach, CA 92660.

Jan 13-15 Communication Networks Conference and Exposition, Albert Thomas Convention Ctr., Houston, TX, to bring together communications professionals, policy makers, carrier, service and hardware vendors who are interested in combining voice, data and message applications. Terri Hamilton, 60 Austin St., Newton, MA 02160, (800) 225-4260.

Jan 14-19 National Audio-Visual Convention, Convention Ctr., Dallas, TX, conferences and exhibitions on video equipment, microcomputer hardware and software, videotape libraries, projection equipment and techniques, remote access and retrieval systems, programmers and multi-projector control devices, overhead transparencies. National Audio-Visual Assoc., 3150 Spring St., Fairfax, VA 22031, (703) 273-7200.

Jan 16-17 Microcomputer Educational Conference, Arizona State U, Tempe, AZ, forum to introduce educators to microcomputer applications in the classroom, including elementary and secondary schools, fine arts, career and vocational studies and special education. Dr. Gary G. Bitter, Arizona State U., Payne 203, Tempe, AZ 85281.

Jan 17-18 Educational Software Symposium, Holiday Inn, Bridgeport, CT, topics include educational software in elementary schools, mathematics, science, foreign languages, simulations. Queue, 5 Chapel Hill Dr., Fairfield, CT 06432.

Jan 27-29 Advanced Semiconductor Equipment Exposition, Convention Center, San Jose, CA, new products and emerging technology in semiconductor equipment explored in seminars and exhibits. Cartlidge & Assoc., 491 Macara Ave., Suite 1014, Sunnyvale, CA 94806, (408) 245-6870.

Feb 4-5 Computer and Office Automation Show and Conference, Hyatt Regency Hotel, Vancouver, British Columbia, data processing equipment, small business computers, computer peripheral products, medium and high speed copiers, word processing systems, data communication gear and services and a full range of conventional office

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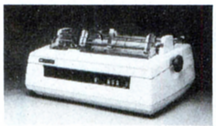

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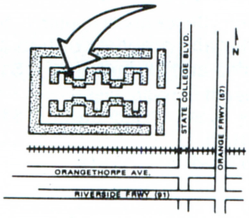

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CALENDAR

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Mar 24-26 SSE '81 Southwest Semiconductor Exposition, Civic Plaza Convention Ctr., Phoenix, AZ, exhibitions and semiconductor, hybrid, and printed circuit board production, processing, and test equipment. Cartlidge & Assoc., 491 Macara Ave., Suite 1014, Sunnyvale, CA 94086, (408) 245-6870.

Mar 31-Apr 2 Cincinnati Business Show, Convention-Exposition Ctr., Cincinnati, OH, exhibitions of automated systems, communications, computers, telephone systems, word processing, data processing, supplies, printing equipment, furniture, bindings, graphics, forms. Weber & Assoc., 5679 Creek Rd., Cincinnati, OH, 45242, (513) 531-5959.

Apr 1-2 Southwest Printed Circuits & Microelectronics Exposition '81, Market Hall, Dallas, TX, manufacturing exhibits and displays geared to regions of Texas, Oklahoma, Arkansas, Louisiana, and New Mexico. Also held Apr 15-16 at Sheraton Twin-Tower Convention Ctr., Orlando, FL for southeastern regions. Industrial & Scientific Conference Mgmt., Inc., 222 W. Adams St., Chicago, IL 60606, (312) 263-4866.

Apr 28-30 International Telecommunications Forum, Concorde Lafayette Hotel, Paris, France, discussing strategies for suppliers and users in new telecommunication products and services. Dusty Rhodes, Arthur D. Little Decision Resources, Acorn Park, Cambridge, MA 02140, (617) 267-3456.

May 10-13 European Consumer Electronics Show, Nuremburg Fair Centre, Nuremburg, W. Germany, exhibitors from all over the world, including U.S., Japan, Europe, and the Far East, offering a complete range of electronic equipment for business and consumer use. Tom May, Industrial and Trade Fairs, Ltd., Radcliffe House, Bleaheim Ct., Solihull, West Midlands B91 2BG, England, (021) 705-6707, Telex: 337073.

May 13-16 International Business Show, Tokoyo International Trade Fair Grounds, Harumi, Tokoyo, Japan, displays of business machines and equipment including desktop calculators, electronic cash registers, data processing machines, peripherals, filing systems, facsimiles and other communication systems and equipment. Nippon Administrative Mgmt., Seikyo Kaikan Bldg., 1-13, Sendagay 4-chome, Shibuya-ku, Tokoyo, Japan, (03) 403-1331.

June 15-18 National Computer Graphics Conference, Convention Ctr., Baltimore, MD, tutorials, meetings, and exhibits on business graphics, computer mapping, financial, educational, and medical graphics, design, software and database, telecommunications, and marketing graphics. NCGA, 2033 M Street, N.W., Suite 330, Washington, D.C. 20036, (202) 466-5895.

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BOOK REVIEWS

Programming and Interfacing the 6502, with Experiments

by Marvin L. De Jong
Howard W. Sams, Indianapolis, IN

Reviewed by Rocky Smolin

To aid latent inventors, this excellent book covers just about everything anyone would want to know about the 6502 microprocessor. This common processor is used in several popular microcomputer prototyping systems: the Kim-1, Sim-1, and Rockwell's Aim-65. It is also in the Pet, Apple II, and OSI Challenger.

The book serves equally well as a teaching guide and reference manual. Each chapter contains step-by-step experiments. The instructions for each experiment leave something to the skill and ingenuity of the experimenter—any of the above machines could be used and all differ slightly in operation. For clarity, De Jong has outlined the differences between machines, as in the memory maps.

The first section, covering programming, is divided into ten chapters that discuss I/O, logical operations, arithmetic operations, etc. The last chapter, covering interval timers, serves as an introduction to the section on interfacing, since the presence of timers in a computer really only come into play as they are interfaced to the real world.

The second section gets into the nitty-gritty of interfacing, starting with the basics of address decoding. The introduction to the experiments prepares the reader for a trip to the components store for some chips, edge connector, and breadboard. The section goes on to explain control signals, output ports, data busses, buffering, and a host of other interfacing topics.

Extensive appendices are included covering numbering systems, instruction set and technical data for the 6502, and pin configurations for commonly used SN7400 chips. I would not recommend buying this book along with your first soldering iron; it requires some previous knowledge and experience in electronics. But for weekend experimenters who have a sure idea to make an intelligent 'whatever', but are stopped by lack of technical knowledge, the book will come in handy.

414 pages $13.95

The Practical Guide to Structured Systems Design

by Meilir Page-Jones
Yourdon Press, New York, NY

This book can be appreciated by those who have spent years programming and maintaining all types of systems wherein the design was done at the lowest level and half the files and programs were obvious tack-ons. What the author is trying to do is provide some badly needed tools to organize the front end of data processing systems projects. The goal is to yield systems that actually work the way the purchaser expected.

The presentation is fairly exhaustive; the author is to be congratulated on his careful approach to the topic. An extensive index is also helpful.

After preliminaries, the fundamentals of design are covered: what it does, who does it, and how it is done. The next section deals extensively with the tools: the structure chart, the stuctured specification, and module specification methods. Perhaps the most practical section discusses the qualities of good design. Following the guidelines in this section should result in a marked improvement in the manageability of any systems design.

Even the manager is not overlooked, as the author includes a section on the management aspects of structured design, and how it effects a DP department.

Its entertaining style makes the book readable, although the subject matter is difficult. The book lends itself best to the classroom where the time and resources for experimenting are available. ***R.S.***

368 pages $19.50

The CP/M Handbook with MP/M
by Rodnay Zaks
Sybex, Berkeley, CA

Reviewed by Roland H. Alden

Since it was introduced in 1975, CP/M has become the most popular operating system for microprocessor-based computers. This well-written book will satisfy the requirements of first-time users, as well as veteran CP/M experts.

The first few chapters provide a tutorial introduction, containing many hints concerning the use of computers. It will prove invaluable to users installing their first system. Also included are a tour of internals of CP/M and detailed descriptions of the sub-systems and processes that make it function. Such information can be useful to advanced programmers when writing systems software, or tracking down elusive program errors.

A reference guide to every CP/M and MP/M command is provided. Each command is annotated with the versions it is applicable to. This attention to detail is typical of the entire book.

The appendices provide all the tools necessary to turn the book into a valuable reference manual: a summary of error messages, conversion tables, discussion of command parameter lists, device names, failure checklist and troubleshooting hints.

The only disappointment is that there is really not much information on MP/M. Many of the commands are similar, but MP/M is fundamentally quite different from CP/M. For the CP/M user, however, this book will provide an excellent adjunct to the standard documentation library.

321 pages $13.95

Practical Basic Programs
edited by Lon Poole
Osborne/McGraw-Hill, Berkeley, CA

Reviewed by Jim Schreier

Finding easy programs that do something useful has always been a challenge for small computer users. Good software remains elusive. Because the printed listing is the only way to effectively share Basic programs, this book is a welcome sequel to the popular *Some Common Basic Programs*. Both books are similar in format: shorter listings that stand alone or may be used as subroutines within more extensive programs. The 40 programs include: financial, management, home, statistical, math, science and music applications.

The checkbook reconciliation, home budgeting and income averaging programs alone make this book a useful invest-

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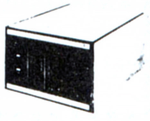

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ment. The home budgeting program extends over 15 pages with an 8000-byte listing. With two minor exceptions, it works reasonably well. Line 3130 needs to be altered from 'if D2<1 then 3020' to 'if D2<0 then 3020' in order that the date inputs may be accepted and calculated. There appears to be a problem with the day correlating with the correct day of the week as the program runs. Adding a new line: 2965 N = N + 1 seems to fix it.

The most enlightening program is the Rule of 78's interest. This program bluntly details the cruelest method of calculating interest on loans. Some states, such as Arizona, have recently outlawed the Rule of 78's, but almost everyone borrowing money has been subjected to it. Anyone thinking about a credit purchase should run this program before the papers are signed.

The numeric base conversion program will convert from any base under 35, but simple program alterations allow almost any base conversion. For example 825,062 base 10 is HOME base 36. These unusual number bases may be a unique way to code electronic mail.

Those entering programs should be prepared to make two adjustments. The listings are designed for a dumb CRT (and a Basic without 'tab' statements) with no provisions for data storage. CRT screen formatting may be done as the program is being entered; but adding data files can be more difficult. Numerous 'rem' statements guide the user through key variables, but an index to the variables would have been welcome.

171 pages $15

Basic Computer Programs for the Home

by Charles D. Sternberg

Hayden Book Co., Rochelle Park, NJ

Reviewed by David Marca

A large assortment of household-related programs is presented in this work. All are written in Basic, organized according to a specific home application.

The stated purpose of making your computer start paying for itself is certainly ambitious. While most readers would probably not succeed in meeting that expectation, the book has potential benefits.

There is good usage of Basic, giving examples of simple and advanced features. Program documentation is designed to be an aid in understanding, but not a tutorial on a program's entire operation, or why it was written in a particular manner. The programs are reasonably short and easy to understand without tremendous effort. Expected output is given for each program, which is an important aid to testing.

The most obvious asset of the book is its coverage of a large spectrum of household applications. Lots of good ideas can be gained, sometimes by entering and testing the code, other times by just reading the programs.

The book is recommended to those who have just purchased their first microcomputer, and have little or no programming experience. They can get reasonably useful programs working much faster than they would blindly forging ahead on their own. More advanced users may find interesting ideas scattered about, but its overall usefulness is questionable.

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Magic Wand
Continued from page 68

Additional features include ghost hyphenation, underlining, boldface, superscripts, and subscripts (if the printer supports these features).

The ghost hyphen indicates where a long word can be hyphenated if necessary. The default symbol is the ampersand, but can be changed to something else. In any case, the chosen character will not appear in the final printing.

Dynamic commands can be used to print a heading at the top of each page and the page number at the top or the bottom of the page. Messages can be printed on the console to keep the operator informed. The 'print' program does not use a very large memory buffer. Consequently, a printer that is not buffered will stop every 15 lines or so while the disk is accessed.

The freeform entry of the edit mode is a useful feature for normal report preparation. However, it is awkward for assembly language programming where fields are vertically aligned. For this reason, Magic Wand is provided with another mode. If the file to be edited or created has a file type of ASC, ASM, BAS, COB, FOR, MAC, or PRN, the program mode rather than text mode is automatically selected. For other file types, the user can select program mode with the command of MP. In this mode, Magic Wand expects a carriage return at the end of each line. It then inserts both a carriage return and a line feed. The carriage return is not indicated on the screen by the tilde as it is in text mode. Files produced in this mode are compatible with the other CP/M editors.

Its great advantage is its form-free entry...text can be typed without thinking about where the line ends

Some of the features of the Magic Wand are identical to those found in the Word-Master editor. For example, the cursor is moved up, down, left, and right by the regular, cursor control keys. Control-X scrolls text up one line and control-E scrolls it down one line. Control-C and control-R respectively scroll the text up and down one screenful. The tab key moves the cursor to the next tab stop.

Other commands, however, are very different. Single characters are deleted with a control-D in Magic Wand, but with a control-G in Word-Master; text to the right of the cursor is deleted with a control-N in Magic Wand but with a control-P in Word-Master. Both programs buffer the console keyboard.

Magic Wand's great advantage is its free-form entry. The user can type the text without thinking about where the line ends. Additional features include the ability to print the current file, display the disk directory, and list Ascii files on the screen while the user is still in edit mode.

Magic Wand is excellent for generating straight text for reports, proposals, and form letters. Word-Master, however, appears to be better for generating Basic, Pascal and assembly language programs.

Version 2 of CP/M uses the backspace key (control-H) for correcting input errors, whereas version 1 does not. On the other hand, the backspace key is an integral part of the regular APL language. The newest version (3.2) properly handles the backspace character. Earlier versions work properly with version 1.4 CP/M, but not with version 2.

As a result, Vanguard has recently released a patch for their versions 3.0 and 3.1. After alteration, its APL will properly handle the backspace command in CP/M version 2. To implement this change, load the APL interpreter into memory with the system debugger DDT or SID. Fill the block of memory from 0472 hex to 047A hex with binary zeros. Return to CP/M and save the new file:

```
SAVE 127 APLV80.COM
```

Version 2 of CP/M allows the user to individually write-protect any file on the diskette. There is a problem, however, with hex files. If this type of file is declared as read-only, the system debugger will load the file relative to address 100 hex regardless of its proper load address. Suppose, for example, that a version of CBios is assembled to run at the address of DA00 hex. If you want to load a copy of CBios at address 100 hex using the system debugger, you would normally give the command of:

```
ICBIOS.HEX
R2700
```

where the hex value of 2700 is the offset from DA00 hex to 100 hex. However, if this hex file has been declared as read-only, it will be loaded at address 2800 hex instead. The solution to this problem is to be sure that hex-type files are not write-protected.

Another subtle problem occurs with 'submit' files. This automatically executes a series of commands that would normally be given from the console. The commands are placed in a disk file with the file extension name of 'sub'. Then the program 'submit' can be executed.

Unfortunately, there is a bug in 'submit'. If an extra carriage-return/line-feed pair, i.e., an empty line, is placed at the end of the submit file, the submit operation will be aborted before any commands are executed. Furthermore, there is no indication of an error. The solution is to avoid placing an extra blank line at the end of the submit file.

There is an easy way to keep track of the files on each diskette. Press control-P to turn on the printer, then give the command 'stat *.*.' Tear off the listing and place it into the diskette envelope. Before you make the listing, however, generate a unique name, such as a date, on each diskette. Be sure to use only a felt-tipped pen so that the diskette is not damaged. Save a dummy file with this name, but be sure to give it a file length of zero. Futhermore, begin the filename with a comma. For example, the command might look like this:

```
SAVE 0 ,SEP1480
```

The comma will cause the filename to appear at the top of the alphabetical 'stat' listing. This dummy entry won't actually use any space on the disk, since its size is declared to be zero.

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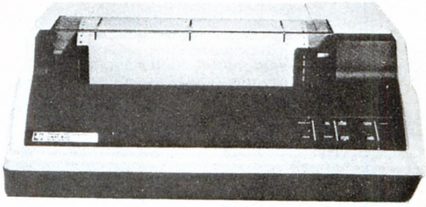

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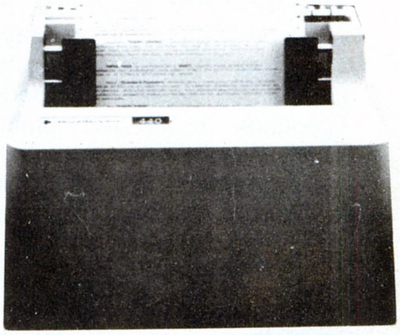

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Continued from page 72

```
SELECT ACTION FROM TABLE ABOVE  I

AREA. EXAMPLE, A. NO = NO MORE AREAS B
DO YOU WANT A PRINTED COPY ? Y = YES, N = NO  Y

          SAILING CENTER   FORT WORTH,  TEXAS  76126   817-249-0166

                     INVENTORY LIST FOR AREA B              3-21-1980

LOC    CK QUAN P/N      DESCRIPTION        LOC    CK QUAN P/N      DESCRIPTION
B17     .. 4    123077  SCREW              B33     .. 2    172123  SW & CABLE
B310    .. 1    172127  OIL SENDER         B93     .. 0    172189  PT (N/A)
B83     .. 1    172193  FUSE PANEL         B43     .. 2    172371  ADAPTOR
B87     .. 1    172473  OIL DRAIN PUMP     B93     .. 1    172509  POWERTILT
B93     .. 1    172510  POWER TILT         B26     .. 4    172522  TUNE-UP KIT
B27     .. 4    172523  TUNE-UP KIT        B28     .. 2    172524  TUNE-UP KIT
B29     .. 2    172525  TUNE-UP KIT        B210    .. 2    172527  TUNE-UP KIT
B211    .. 2    172528  TUNE-UP KIT        B212    .. 1    172530  TUNE-UP KIT
B213    .. 2    172531  TUNE-UP KIT        B93     .. 1    172654  BINCLE MT (N/A)
B313    .. 2    172739  SWITCH             B24     .. 2    172806  TUNE UP KIT
AREA. EXAMPLE, A. NO = NO MORE AREAS NO
```

Figure 6. Inventory list by location.

The inventory check list prints two columns of parts per page to save space when taking inventory (figure 6). The location is listed first for convenience. A space is provided before the quantity on record to enter the actual quantity found during the inventory check. If the figures agree, it is only necessary to check it off and continue. All the part numbers for area B are shown. The location numbers may be sorted to make it easier to take inventory in areas that have a lot of part numbers.

The index speeds up the operation of the program by partitioning the file in increments of 50. Part numbers are located within these increments by comparing only 50 numbers rather than up to 3200. A new index must be done after any change to the order of the records in the file. That is, after sorting, adding or deleting part numbers.

The 'swap' feature is used to exchange disks in drive B. For inventories of less than 3200 part numbers, this is not required.

This program will allow you to build an inventory file and to keep it in good working order and give you the power to control that inventory with a significant savings in time and money. □

Excerpted from the book "Inventory Control for Profit and Peace of Mind" by Dilithium Press.

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Program listing

```
 REM PFM INVENTORY FILE PROGRAM  COPYRIGHT 1979 CHUCK ATKINSON
 REM ROUTE 5, BOX 277-C FORT WORTH, TEXAS 76126
 PRINT:PRINT "PARTS FILE MAINTENANCE PROGRAM  VERS 1"
 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
PRINT:PRINT:PRINT:PRINT:INPUT"TODAY'S DATE?" LINE DATE$
10 N$="VENDOR"
FILE N$(150)
N=1
IF END #1 THEN 20
READ #1,N;NAM$,SR$,CTY$,ST$,Z$,PH$,RMK$,V$
20 CLOSE 1
50 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT

PRINT TAB(15);"TABLE OF OPERATIONS"
PRINT:PRINT "A = ADD P/N TO INVENTORY";TAB(40);"C = CHANGE THE DATA"
PRINT:PRINT "V = VENDOR FILE";TAB(40);"L = LIST THE COMPLETE INVENTORY"
PRINT:PRINT"P = PRICE LIST";TAB(40);"I = INVENTORY CHECK LIST"
PRINT:PRINT "X = INDEX" TAB(40);"END = END OF RUN"
PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
INPUT "SELECT ACTION FROM TABLE ABOVE" X$
PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
I=0
IF X$="A" THEN 60
IF X$="X" THEN 200
IF X$="L" THEN 300
IF X$="V" THEN 500
IF X$="C" THEN 600
IF X$="P" THEN 700
IF X$="I" THEN 800
IF X$ = "CREATE" THEN 195
IF X$="END" THEN 9990
60 REM ADD TO FILE
PRINT:PRINT
70 OPEN "B:PART" RECL 80 AS 1
I=1
READ #1,I;N
CLOSE 1
75 I=0
PRINT "THE LAST RECORD ON FILE IS ";N
IF N>3799 THEN PRINT "DISK FULL AT 3800 RECORDS"
IF N>3900 THEN 50
80 OPEN "B:PART" RECL 80 AS 1
IF END #1 THEN 100
I=N
READ #1,I;L
100 PRINT:PRINT :INPUT "PART NUMBER";P$
PRINT:PRINT:INPUT "LOCATION. EXAMPLE, B,25";L$,L
PRINT:PRINT:INPUT"MINIMUM STOCK LEVEL";MN
PRINT:PRINT:INPUT"MAXIMUM STOCK LEVEL";MX
PRINT:PRINT:PRINT TAB(13);"--15 LTRS MAX--"
INPUT"DESCRIPTION";D$
PRINT:PRINT:INPUT"QUANTITY IN STOCK";OH
PRINT:PRINT:INPUT"LIST PRICE TO THE PENNY.";R
PRINT:PRINT:INPUT"VENDOR (SOURCE) CODE";V$
PRINT:PRINT:INPUT "MANUFACTURER CODE";M$
PRINT:PRINT:INPUT "DISCOUNT IN %. EXAMPLE, 50 FOR 50 ";J
110 PRINT:PRINT:PRINT I;" " V$;" ";P$;" " D$;" ";J;" ";R;" ";L$;L;" ";OH;"
 ";MN;" " MX
PRINT:PRINT:PRINT:I=I+1
120 PRINT "NOW PRINTING FILE AT I=";I
PRINT #1,I;P$,V$,M$,L$,L,D$,J,R,OH,MN,MX,OO,S,YT
N=N+1
```

```
130 CLOSE 1
OPEN "B:PART" RECL 80 AS 1
I=1
READ #1,I;N
N=N+1
D$="RECORDS":V$="-":F$="-":R=0:J=0:CO=0:S=0:YT=0:OH=0:MN=0:MX=0
PRINT #1,I;N,V$,M$,L$,L,D$,J,R,OH,MN,MX,OO,S,YT
CLOSE 1:GOTO 50
195 PRINT:PRINT "WARNING! CREATE ERASES THE ENTIRE FILE AND SHOULD ONLY"
PRINT "BE USED TO START A NEW FILE."
PRINT:PRINT:INPUT "DO YOU STILL WANT TO CREATE? Y = YES, N = NO";X$
IF X$="N" THEN 50
IF X$="Y" THEN 198
GOTO 50
198 PRINT:PRINT:CREATE "B:PART" RECL 80 AS 1
IF END #1 THEN 1000
M$="0":J=0:R=0:OH=0:MN=0:MX=0:OO=0:S=0:YT=0:L=0:L$="0":V$="-":P$="NU":D$="
FILE"
I=1
PRINT #1;1,V$,M$,F$,P$,D$,J,R,OH,MN,MX,OO,S,YT
PRINT:PRINT "CREATED NEW FILE, PART"
FOR X=1 TO 200
NEXT X
GOTO 1000
200 PRINT:PRINT "RUN INDEX AFTER ADDING NEW PART NUMBERS TO THE FILE OR"
PRINT "AFTER SORTING THE FILE. "
INPUT "DO YOU WANT TO INDEX? Y = YES, N = NO";X$
IF X$="N" THEN 50
CREATE "B:INDEX" RECL 18 AS 1
N=0:I=0:K=2
OPEN "B:PART" RECL 80 AS 2
210 N=N+1
220 I=I+1
IF END #2 THEN 290
READ #2;PN
IF I=K THEN 230
GOTO 220
230 PRINT #1;PN,I
PRINT I,PN
K=K+50
GOTO 210
290 CLOSE 2:CLOSE 1:GOTO 50
300 REM COMPLETE LIST
GOSUB 900
GOSUB 910
PRINT:PRINT TAB(17);"THE COMPLETE INVENTORY LIST  ";TAB(56);DATE$
PRINT
PRINT "STK #";TAB(8);"P/N";TAB(17);"DESCRIPTION";TAB(33);"LIST";TAB(40);"Q
TY";TAB(44);"LOC";TAB(51);"V";TAB(54);"MF"; TAB(57);"OO";TAB(61);"MIN";TAB
(65);"MAX";TAB(69);"MON";TAB(73);"YTD";TAB(77);"%"
T2=0
385 OPEN "B:PART" RECL 80 AS 1
390 K=O:Q=0:P=1
400 I=I+1:Q=Q+1
IF X$="N" THEN K=K+1
IF END #1 THEN 420
READ #1;P$,V$,M$,L$,L,D$,J,R,OH,MN,MX,OO,S,YT
C=R*J/100
PRINT I;TAB(8);P$;TAB(17);D$;TAB(32);R;TAB(39);OH;TAB(44);L$;L;TAB(51);V$;
TAB(54);M$;TAB(57);OO;TAB(60);MN;TAB(64);MX;TAB(68);S;TAB(72);YT;TAB(76);J

LET T2=T2+C*OH
IF Q = 55 THEN 402
IF K=20 THEN 401
```

```
GOTO 400
401 K=0
INPUT"
GOTO 400
402 PRINT TAB(40);P
INPUT "                                                   .";
Q=0
P=P+1
GOSUB 910
PRINT:PRINT TAB(30);"THE COMPLETE INVENTORY LIST";TAB(69);"PAGE ";P
GOTO 400
420 CLOSE 1
424 PRINT:PRINT "THE TOTAL NET IS ":PRINT USING "#####.##";T2
CONSOLE
INPUT "                                                   .";
GOTO 50
500 REM HEADING AND VENDORS FILE
PRINT:PRINT
INPUT "L = LIST VENDORS, C = CHANGE OR ADD VENDORS.";A$
IF A$="L" THEN 592
PRINT:PRINT
INPUT "VENDOR RECORD # TO BE CHANGED. 0 IF ADDING NEW NAME. ";I
IF I=0 THEN 502
N$="VENDOR"
FILE N$(150)
READ #1,I;NAM$,SR$,CTY$,ST$,Z$,PH$,RMK$,V$
PRINT I,NAM$:CLOSE 1:GOTO 505
502 N$="VENDOR"
FILE N$(150)
503 I=I+1
IF END #1 THEN 504
READ #1,I;NAM$
GOTO 503
504 NAM$="-":SR$="-":CTY$="-":ST$="-":Z$="-":PH$="-":RMK$="-":CLOSE 1
505 PRINT:PRINT"VENDOR INFORMATION"
PRINT:PRINT "M = VENDOR NAME";TAB(40);"S = STREET ADDRESS"
PRINT
PRINT "C = CITY AND STATE";TAB(40);"Z = ZIP CODE"
PRINT
PRINT "P = PHONE NUMBER";TAB(40);"R = REMARKS"
PRINT
PRINT "V = VENDOR CODE";TAB(40);"NO = NO MORE CHANGES"
PRINT
PRINT V$;" ";NAM$;" ";SR$;" ";CTY$;" ";ST$;" ";Z$;"  ";PH$
PRINT:PRINT RMK$
PRINT:PRINT
INPUT "SELECT ITEM TO BE CHANGED FROM TABLE ABOVE";X$
PRINT:PRINT
IF X$="NO" THEN 560
IF X$="M" THEN 506
IF X$="S" THEN 510
IF X$="C" THEN 530
IF X$="Z" THEN 535
IF X$="P" THEN 540
IF X$="R" THEN 545
IF X$="V" THEN 550
PRINT
506 INPUT "NEW VENDOR NAME";NAM$
GOTO 505
510 INPUT "NEW STREET ADDRESS";SR$
GOTO 505
530 INPUT "NEW CITY,STATE  ";CTY$,ST$
GOTO 505
```

```
PRINT:PRINT "M = MANUFACTURER";TAB(27);"DC = DISCOUNT";TAB(53);"NO = NO MO
RE CHANGES"
PRINT:PRINT
PRINT TAB(6);"L";TAB(12);"Q";TAB(16);"V";TAB(22);"P";TAB(31);"D";TAB(49);"
PR";   TAB(59);"O";TAB(63);"MN";TAB(67);"MX";TAB(71);"S";TAB(75);"Y";TAB(7
8);"DC"
PRINT
PRINT     "STK#";TAB(6);"LOC";TAB(12);"QTY";TAB(16);"V";TAB(22); "P/N";TAB
(31);"DESCRIPTION";TAB(49);"PRICE";TAB(59);"OO";TAB(63);"MIN";TAB(67);"MAX
" TAB(71) "MON" TAB(75) "YTD" TAB(79) "%"

PRINT:PRINT I;TAB(6);L$;L;TAB(11);OH;TAB(16);V$;TAB(22);P$;TAB(31);D$;TAB(
48);R;TAB(58);OO;TAB(62);MN;TAB(66);MX;TAB(70);S;TAB(74);YT;TAB(77);J
PRINT:INPUT "SELECT CHANGE TO BE MADE FROM TABLE ABOVE";C$
PRINT:PRINT
IF C$="M" THEN 638
IF C$="L" THEN 640
IF C$="V" THEN 642
IF C$="A" THEN 644
IF C$="P" THEN 646
IF C$="D" THEN 648
IF C$="DC" THEN 650
IF C$="PR" THEN 652
IF C$="Q" THEN 654
IF C$="MN" THEN 656
IF C$="MX" THEN 658
IF C$="O" THEN 660
IF C$="Y" THEN 662
IF C$="S" THEN 664
IF C$="NO" THEN 670
PRINT
638 INPUT"NEW MANUFACTURER";M$
GOTO 668
640 INPUT"NEW LOCATION. EXAMPLE B,25";L$,L
GOTO 668
642 INPUT "NEW VENDOR";V$
GOTO 668
644 INPUT "NEW AREA LOCATION";F$
GOTO 668
646 INPUT "NEW PART NUMBER";P$
GOTO 668
648 INPUT"NEW DESCRIPTION";D$
GOTO 668
650 INPUT "NEW DISCOUNT";J
GOTO 668
652 INPUT "NEW PRICE";R
GOTO 668
654 INPUT "NEW QUANTITY ON HAND";OH
GOTO 668
656 INPUT"NEW MINIMUM";MN
GOTO 668
658 INPUT"NEW MAXIMUM";MX
GOTO 668
660 INPUT "NEW ON ORDER";OO
GOTO 668
662 INPUT"NEW YEAR TO DATE SOLD";YT
GOTO 668
664 INPUT "NEW AMOUNT SOLD THIS MONTH";S
GOTO 668
668 PRINT I;L;V$;M$;P$;D$;J;R;OH;MN;MX;OO;S;YT
GOTO 628
PRINT:PRINT
670 INPUT "DO YOU WANT TO FILE THIS? Y = YES, N = NO";X$
```

```
535 INPUT "NEW ZIP CODE";Z$
GOTO 505
540 INPUT"PHONE NUMBER. EXAMPLE,  517-469-6329";PH$
GOTO 505
PRINT TAB(9);"--------------------MAX LENGTH--------------------------"
545 INPUT"REMARKS. NO COMMAS, PLEASE.";RMK$
GOTO 505

550 INPUT "VENDOR CODE";V$
GOTO 505
560 PRINT
564 N$="VENDOR"
FILE N$(150)
IF END #1 THEN 590
READ #1,I;NAM2$,SR2$,CTY2$,ST2$,Z2$,PH2$,RMK2$,V2$
580 PRINT:PRINT "#";I;" NOW READS:"
PRINT:PRINT NAM2$,PH2$,V2$
PRINT:PRINT SR2$,CTY2$,ST2$,Z2$
PRINT:PRINT RMK2$
PRINT:PRINT
PRINT "WHEN CHANGED, IT WILL READ:"
PRINT:PRINT NAM$,PH$,V$
PRINT:PRINT SR$,CTY$,ST$,Z$
PRINT:PRINT RMK$:PRINT:PRINT
INPUT "DO YOU WANT TO MAKE THE CHANGE? Y = YES, N = NO";X$
PRINT:PRINT
IF X$="Y" THEN 590
IF X$="N" THEN 1000
590 PRINT #1,I;NAM$,SR$,CTY$,ST$,Z$,PH$,RMK$,V$
CLOSE 1:GOTO 10:REM LIST THE VENDOR FILE
592 N$="VENDOR"
GOSUB 900
PRINT TAB(16):"VENDORS, SUPPLIERS AND MANUFACTURERS";TAB(56);DATE$
PRINT:FILE N$(150)
593 I=I+1
IF END #1 THEN 599
READ #1,I;NAM$,SR$,CTY$,ST$,Z$,PH$,RMK$,V$
PRINT I;V$;" ";NAM$;" ";PH$;" ";SR$;" ";CTY$;" ";ST$;" ";Z$
PRINT TAB(3);RMK$:PRINT
IF X$="Y" THEN 593
FOR X=1 TO 300
NEXT X
GOTO 593
599 CONSOLE:GOTO 1000
600 REM CHANGE THE INVENTORY MASTER FILE
TRUE = -1
OPEN "B:PART" RECL 80 AS 1
IF END #1 THEN 615
WHILE TRUE
INPUT "CHANGE WHICH STOCK NUMBER?";I
READ #1,I;L
GOTO 620
WEND
615 PRINT:PRINT "NUMBER ";I;" TOO BIG. PLEASE CHECK IT.":GOTO 1000
620 READ #1,I;P$,V$,M$,L$,L,D$,J,R,OH,MN,MX,OO,S,YT
628 PRINT:PRINT:PRINT:PRINT:PRINT TAB(20);"TABLE OF CHANGES"
PRINT:PRINT"L = LOCATION #";TAB(27);"P = PART NUMBER";TAB(53);"MN = MINIMU
M"
PRINT:PRINT "Q = QUANTITY ON HAND";TAB(27);"D = DESCRIPTION";TAB(53);"MX =
 MAXIMUM"
PRINT:PRINT "V = VENDOR";TAB(27);"PR = PRICE";TAB(53);"S = SALES THIS MONT
H"
PRINT:PRINT "A = AREA LOCATION";TAB(27);"O = ON ORDER";TAB(53);"Y = YEAR T
O DATE"
```

```
IF X$="N" THEN 1000
680 PRINT #1,I;P$,V$,M$,L$,L,D$,J,R,OH,MN,MX,OO,S,YT
GOTO 1000
700 REM PRICE LIST
GOSUB 900
GOSUB 910
PRINT:PRINT TAB(20);"PARTS PRICE LIST";TAB(56);DATE$
PRINT:PRINT "STK#";TAB(10);"PART NUMBER";TAB(25);"DESCRIPTION";TAB(45);"PR
ICE";TAB(53);"QUANTITY";TAB(65);"LOCATION";TAB(75);"VEN"
OPEN "B:PART" RECL 80 AS 1
I=0
710 I=I+1
IF END #1 THEN 760
READ #1;P$,V$,M$,L$,L,D$,J,R,OH,MN,MX,OO,S,YT
PRINT I;TAB(10);P$;TAB(25);D$;TAB(45);R;TAB(55);OH;TAB(65);L$;L;TAB(75);V$
GOTO 710
760 CONSOLE
GOTO 1000
800 REM INVENTORY LIST BY AREA
810 INPUT "AREA. EXAMPLE, A. NO = NO MORE AREAS";A$
IF A$="NO" THEN 50
GOSUB 900
GOSUB 910
PRINT:PRINT TAB(17);"INVENTORY LIST FOR AREA ";A$;TAB(56);DATE$
PRINT
PRINT"LOC";TAB(7);"CK";TAB(10);"QUAN";TAB(15);"P/N";TAB(23);"DESCRIPTION";
      TAB(41);"LOC";TAB(47);"CK";TAB(50);"QUAN";TAB(55);"P/N";TAB(63);"DES
CRIPTION"
OPEN "B:PART" RECL 80 AS 1
I=0
820 I=I+1
IF END #1 THEN 880
READ #1;P$,V$,M$,L$,L,D$,J,R,OH,MN,MX,OO,S,YT
IF L$=A$ THEN 830
GOTO 820
830 I=I+1
IF END #1 THEN 880
READ #1;P2$,V2$,M2$,L2$,L2,D2$,J2,R2,OH2,MN2,MX2,OO2,S2,YT2
IF L2$=A$ THEN 840
GOTO 830
840       PRINT L$;L;TAB(8);"..";TAB(10);OH;TAB(15);P$;TAB(23);D$;TAB(41);L
2$;L2;TAB(48);"..";TAB(50);OH2;TAB(55);P2$;TAB(63);D2$
GOTO 820
880 CONSOLE
CLOSE 1
GOTO 810
900 REM SUBROUTINE FOR PRINT OPTION
PRINT:PRINT
INPUT "DO YOU WANT A PRINTED COPY ?  Y = YES, N = NO";X$
PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
IF X$="Y" THEN LPRINTER WIDTH 80
RETURN
REM SUBROUTINE TO PRINT HEADING
910 PRINT TAB(10);NAM$;"  ";CTY$;", ";ST$;" ";Z$;"  PHONE ";PH$
RETURN
1000 CLOSE 1
PRINT:PRINT
GOTO 50
9990 PRINT:PRINT:PRINT"ARE THE BACK UP FILES CURRENT?"
9995 PRINT:PRINT:PRINT "REMOVE DISK FROM DRIVE BEFORE TURNING OFF POWER"
PRINT:PRINT:PRINT "COMPUTER POWER    D/FW  TEXAS"
PRINT:PRINT
9999 END
```

Travel Expense Program

continued from page 75

Program listing

```
5 'TRAVEL REPORT
6 ' BY DAVID BUSCH
10 CLS
20 CLEAR 400
30 DIM M(12)
40 FOR N=1 TO 12
50 READ M(N)
60 NEXT N
65 '********** MENU ***********
70 PRINT
80 PRINT
90 PRINT "                    1.) Enter expenses for new trip."
100 PRINT "                   2.) Save expense information to disk."
110 PRINT "                   3.) Print out expense report."
120 PRINT "                   4.) Change fixed rates."
130 PRINT "                   5.) Retrieve previous trip"
140 PRINT
150 PRINT "       Enter choice :";
160 A$=INKEY$
170 IF A$="" GOTO 160
180 A=VAL(A$)
```

```
800 IF MA=0 GOTO 990
810 GOSUB 280
820 INPUT"Enter miles driven";MD
830 MILES=MD*MA
840 GOSUB 280
850 GOTO 930
860 GOSUB 280
870 INPUT "Enter number of miles driven ";MD$
880 MD=VAL(MD$)
890 IF MD<1 PRINT " Input error : use figures": GOTO 860
900 MILES=MD*MA
910 GOTO 990
920 GOSUB 280
930 INPUT"Gasoline purchased to be reimbursed :";GA$
940 GA=VAL(GA$)
950 GOSUB 280
960 PRINT " Repairs, other transportation expenses :";
970 INPUT OTHER$
980 OTHER=VAL(OTHER$)
990 GOSUB 280
1000 INPUT "Enter tolls paid";TLLS
1010 GOSUB 280
1020 INPUT " Enter parking paid";PARK
1030 GOSUB 280
1040 INPUT "Enter number of nights in hotel ";NH
1050 GOSUB 280
1060 IF NH<1 GOTO 1130
1070 FOR N=1 TO NH
1080 PRINT "Enter hotel cost night number ";N;
1090 INPUT CST
1100 HOTELS=HOTELS+CST
1110 GOSUB 280
1120 NEXT N
1130 GOSUB 280
1140 INPUT "Enter any miscellaneous expenses :";MSC
1150 GOSUB 280
1160 INPUT "Enter number of projects, calls, assignments :";NP
1170 FOR N=1 TO NP
1180 GOSUB 280
1190 PRINT "Enter billing or sales from number ";N;
1200 INPUT BILL
1210 SALES=SALES+BILL
1220 NEXT N
1230 IF PER=0 GOTO 1250
1240 COMM=SALES*PER
1245 '****** CALCULATE TOTAL SPENT ON TRIP ********
1250 SPENT=FOOD+HOTELS+AF+CR+TX+MILES+GA+OTHER+TLLS+PARK+MSC
1260 DFLAG=1
1270 CLS
1275 '******* PRINT OUT REPORT **********
1280 PRINT STRING$(64, 191)
1290 F$="$$###.##"
1300 PRINT @ 22,"   Expense Report  "
1310 PRINT DD$
1320 PRINT"Food";
1330 PRINT TAB(9)"";
1340 PRINT USING F$; FOOD;
1350 PRINT "      Hotels";
1360 PRINT TAB(21)"";
1370 PRINT USING F$; HOTELS;
1380 PRINT "      Misc";
1390 PRINT TAB(42)"";
1400 PRINT USING F$; MSC
1410 PRINT "Transportation.........."
1420 PRINT"Car rent";
```

```
190 IF A<1 OR A>5 GOTO 160
200 PRINT A
210 ON A GOTO 320, 220, 220, 2150, 2060
220 IF DFLAG=1 GOTO 270
225 '.....DFLAG SHOWS IF DATA HAS BEEN ENTERED
230 CLS
240 PRINT
250 PRINT "  Error.  No data entered yet."
260 GOTO 70
270 ON A-1 GOTO 1990, 1890
280 CLS
290 PRINT
300 PRINT
310 RETURN
320 GOSUB 280
325 '********* INPUT VARIABLES USED IN REPEATED RUNS *********
330 OPEN "I",2,"RATES"
340 INPUT #2, PD, MA,     PER
350 CLOSE 2
355 '****** INPUT DATA ON CURRENT TRIP *********
360 INPUT" Enter name ";NME$
370 GOSUB 280
380 INPUT "Enter departure day (MM/DD)";RD$
390 DD$=RD$
400 GOSUB 2340
410 LD=X
420 INPUT "Enter return day (MM/DD)";RD$
430 GOSUB 2340
440 RD=X
450 DG=RD-LD+1
460 IF PD>0 THEN FOOD=DG*PD: GOTO 510
470 FOR N=1 TO DG
480 PRINT"Enter reimbursable food expense for day number ";NI;
490 FOOD=FOOD+NI
500 NEXT N
510 GOSUB 280
520 PRINT " Did employee      1.) fly"
530 PRINT "                   2.) drive personal car"
540 PRINT "                   3.) drive company car"
550 PRINT
560 PRINT "      Enter : ";
570 A$=INKEY$
580 IF A$="" GOTO 570
590 A=VAL(A$)
600 IF A<0 OR A>3 GOTO 570
610 PRINT A
620 ON A GOTO 630, 800, 920
630 GOSUB 280
640 INPUT " Enter airfare :";AF
650 GOSUB 280
660 INPUT " Enter number of days car rented :";DC
670 GOSUB 280
680 FOR N=1 TO DC
690 GOSUB 280
700 PRINT " Enter car rental cost day number ";N;
710 INPUT CC
720 CR=CR+CC
730 NEXT N
740 GOSUB 280
750 INPUT"Rentals not central-billed to be reimbursed :";P
760 CENTRAL=CR-P
770 GOSUB 280
780 INPUT "Enter cost of taxis, limos, etc. :";TX
790 GOSUB 280
```

```
1430 PRINT TAB(9)"";
1440 PRINT USING F$; CR;
1450 PRINT"      Taxis";
1460 PRINT TAB(21)"";
1470 PRINT USING F$;TX;
1480 PRINT"       Mileage";
1490 PRINT TAB(42)"";
1500 PRINT USING F$;MILES
1510 PRINT"Gas";
1520 PRINT TAB(9)"";
1530 PRINT USING F$; GA;
1540 PRINT"      Tolls";
1550 PRINT TAB(21)"";
1560 PRINT USING F$; TLLS;
1570 PRINT "        Parking";
1580 PRINT TAB(42)"";
1590 PRINT USING F$; PARK
1600 PRINT"Other";
1610 PRINT TAB(9)"";
1620 PRINT USING F$; OTHER;
1630 PRINT"       Air";
1640 PRINT TAB(21)"";
1650 PRINT USING F$;AF
1660 PRINT "Total Expenses.........";
1670 PRINT USING F$; SPENT;
1680 PRINT "    Reimbursement due....";
1690 PRINT USING F$; SPENT-CENTRAL
1700 PRINT "Calls/projects completed :";NP;
1710 PRINT TAB(30)"Amount of billing/sales :";
1720 PRINT USING F$; SALES
1730 PRINT
1740 IF COMM<>0 THEN PF=SALES-COMM-SPENT: GOTO 1760
1750 PF=SALES-SPENT
1760 PRINT "Net profit :";
1770 PRINT USING F$; PF
1780 PRINT "Profit per call/project :";
1790 PRINT USING F$; PF/NP
1800 IF COMM<>0 PRINT"Commission : ";: PRINT USING F$; COMM
1810 PRINT
1820 IF FLAG=1 GOTO 1930
1830 PRINT" Press 'P' for printout, any other key for menu ";
1840 A$=INKEY$
1850 IF A$="" GOTO 1840
1860 IF A$="P" GOTO 1890
1870 CLS
1880 GOTO 70
1885 '******* SENDS VIDEO OUTPUT TO PRINTER ********
1890 FLAG=1
1900 POKE 16414, 141
1910 POKE 16415, 5
1920 GOTO 1270
1925 '********* RESTORES NORMAL VIDEO OUTPUT *******
1930 POKE 16414, 88
1940 POKE 16415, 4
1950 FLAG=0
1960 CLS
1970 GOTO 70
1980 GOTO 1980
1985 '******* SAVE TRIP DATA TO DISK **********
1990 F$="D" +LEFT$(DD$, 2)+RIGHT$(DD$, 2)
2000 OPEN "O",1, F$
2010 PRINT #1, FOOD, HOTELS, AF, CR, TX, MD, MILES, GA, OTHER, TLLS, PARK, MSC, NP, SALES, SPENT
, CENTRAL, NH, COMM, NME$
2020 CLOSE 1
2030 CLS
```

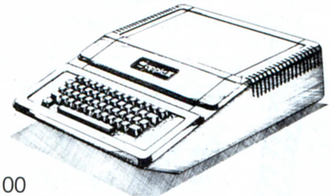
```
2040 PRINT
2050 GOTO 70
2060 CLS
2065 '******** RETRIEVE TRIP DATA FROM DISK ********
2070 PRINT
2080 INPUT "Enter date of trip retrieved  (MM/DD) :";DA$
2090 F$="D" +LEFT$(DA$, 2)+RIGHT$(DA$, 2)
2100 OPEN "I",1, F$
2110 INPUT #1, FOOD, HOTELS, AF, CR, TX, MD, MILES, GA, OTHER, TLLS, PAKR, MSC, NP, SALES, SPENT
, CENTRAL, NH, COMM, NME$
2120 CLOSE 1
2130 DFLAG=1
2140 GOTO 70
2145 '******* CHANGE FIXED RATE VARIABLES *********
2150 CLS
2160 PRINT
2170 PRINT" You may now change fixed rates"
2180 PRINT
2190 INPUT " Food allowance :  enter per diem rate  (0 if none) ";PD$
2200 PD=VAL(PD$)
2210 IF PD<0 OR PD>100 PRINT " Improper entry :": GOTO 2190
2220 INPUT "Mileage allowance : enter cents per mile :";MA
2230 IF MA>1 THEN MA=MA*.01
2240 INPUT "Enter commission percentage :";A$
2250 PER=VAL(A$)
2260 IF PER>1 THEN PER=PER*.01
2265 '******* SAVE VARIABLES TO DISK ********
2270 OPEN "O",1,"RATES"
2280 PRINT #1, PD, MA,      PER
2290 CLOSE 1
2300 CLS
2310 PRINT
2320 PRINT
2330 GOTO 70
2335 '***** CONVERT MM/DD TO CONSECUTIVE DAY OF YEAR ******
2340 FA=0
2350 DD=VAL(RIGHT$(RD$, 2))
2360 DM=VAL(LEFT$(RD$, 2))
2370 FOR N=1 TO DM-1
2380 FA=FA+M(N)
2390 NEXT N
2400 X=28*DM+FA+DD
2410 RETURN
2420 DATA 3, 0, 3, 2, 3, 2, 3, 3, 2, 3, 2, 3
```

Sample run

```
                1.) Enter expenses for new trip.
                2.) Save expense information to disk.
                3.) Print out expense report.
                4.) Change fixed rates.
                5.) Retrieve previous trip

     Enter choice :  4



 You may now change fixed rates

 Food allowance :  enter per diem rate  (0 if none) ? 15
Mileage allowance : enter cents per mile :? 18
Enter commission percentage :? 50
```

```
                1.) Enter expenses for new trip.
                2.) Save expense information to disk.
                3.) Print out expense report.
                4.) Change fixed rates.
                5.) Retrieve previous trip

     Enter choice :  1





 Enter name ? Busch
Enter departure day (MM/DD)? 06/07
Enter return day (MM/DD)? 06/09
 Did employee      1.) fly
                   2.) drive personal car
                   3.) drive company car

     Enter :  1
 Enter airfare :? 400
 Enter number of days car rented :? 3
 Enter car rental cost day number   1 ? 30
 Enter car rental cost day number   2 ? 40
 Enter car rental cost day number   3 ? 40
Rentals not central-billed to be reimbursed :? 30




Enter miles driven? 80
Gasoline purchased to be reimbursed :? 10
 Repairs, other transportation expenses :? 0
Enter tolls paid? 2.50
 Enter parking paid? 5.60
Enter number of nights in hotel ? 2
Enter hotel cost night number   1 ? 45.60
Enter hotel cost night number   2 ? 48.32
Enter any miscellaneous expenses :? 13.201+

Enter number of projects, calls, assignments :? 3
Enter billing or sales from number   1 ? 1000
Enter billing or sales from number   2 ? 1050
Enter billing or sales from number   3 ? 2000





......................   Expense Report  ......................
06/07
Food          $45.00      Hotels  $93.92       Misc  $13.20
Transportation..........
Car rent  $110.00         Taxis    $0.00       Mileage  $14.40
Gas          $10.00       Tolls    $2.50       Parking   $5.60
Other          $0.00      Air $400.00
Total Expenses......... $694.62    Reimbursement due.... $614.62

Calls/projects completed : 3  Amount of billing/sales :$4050.00

Net profit :$1330.38
Profit per call/project : $443.46
Commission : $2025.00

 Press 'P' for printout, any other key for menu
```

Apple II or Apple II Plus w/16K RAM



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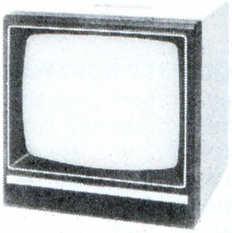

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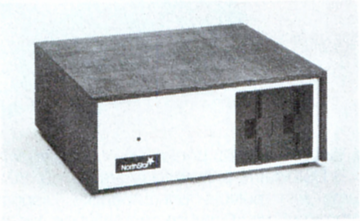

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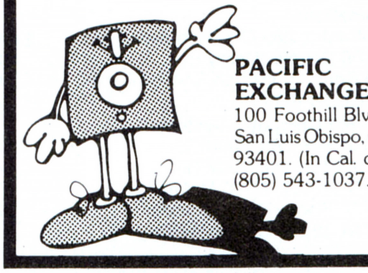

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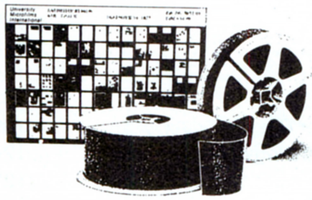

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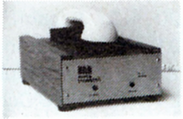

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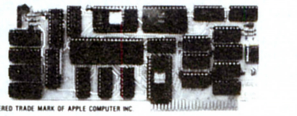

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1. My Field is:
A. ☐ Professional (Medical, Accounting, Law, Etc.)
B. ☐ Engineer (Mechanical, Electrical, Etc.)
C. ☐ Business (Retail, Wholesale, Etc.)
D. ☐ Educational (Professor, Teacher, Assistant, Etc.)
E. ☐ Government (Armed Services, State, Federal, Etc.)
F. ☐ Consumer (Hobbyist, Etc.)
G. ☐ Other

2. My Position/Title is:
A. ☐ Owner/President
B. ☐ Executive Officer
C. ☐ Division/Department Manager
D. ☐ Supervisor
E. ☐ General Staff Member
F. ☐ Consultant
G. ☐ Other

3. I Need This Information for:
A. ☐ Immediate purchase
B. ☐ Purchase 30-60 days
C. ☐ Comparisons
D. ☐ Literature Library
E. ☐ Other

4. My Application is:
A. ☐ Business Only
B. ☐ Business and Personal
C. ☐ Personal Only
D. ☐ Instructional
E. ☐ Research and Development
F. ☐ OEM
G. ☐ Other

5. My Interest Emphasis is:
A. ☐ Hardware
B. ☐ Firmware
C. ☐ Software
D. ☐ Other

6. My Professional Interest is:
A. ☐ Accounting System
B. ☐ Inventory Control System
C. ☐ Process Control System
D. ☐ Medical Research
E. ☐ Educational System
G. ☐ Other

7. My Personal Interest is:
A. ☐ Games
B. ☐ Home Economics
C. ☐ Computer Art and Graphics
D. ☐ Personal Investments
E. ☐ Child Educational Development
F. ☐ Sports
G. ☐ Other

8. My Budget for a Computer System is:
A. ☐ $ 0 - $ 1,999
B. ☐ $ 2,000 - $ 4,999
C. ☐ $ 5,000 - $ 9,999
D. ☐ $10,000 - $20,000
E. ☐ Over $20,000

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